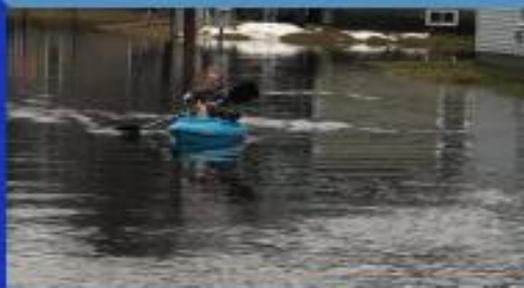


Cumberland County, Maine Hazard Mitigation Plan 2022



Prepared by: Cumberland County Emergency Management Agency



Cover Photo links:

Power lines: <https://portlandphoenix.me/news-analysis-flanagan-hopes-to-help-cmp-weather-consumer-confidence-storm/>

Landslide: <https://www.pressherald.com/2020/09/16/landslide-blocks-presumpscot-river-in-westbrook/#>

Flood: <https://wgme.com/news/local/flooding-strands-cars-closes-roads-washes-away-equipment>

Tornado: <https://www.wmtw.com/article/five-tornadoes-touched-down-in-maine/10249185>

Mt. Washington over Sebago Lake: <https://www.pressherald.com/2011/01/07/local-photogs-lend-talents-to-sebago-lake-calendar/>

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Section 1: Introduction to the New Mitigation Plan

In August of 2020, the Cumberland County Emergency Management Agency (CCEMA) began preparations for updating the 2017 edition of its Hazard Mitigation Plan. It was apparent that in addition to necessary updates, there were several sections that should be added to reflect the current landscape. These include:

1. It was identified that there was a need for a more current and dynamic plan. The original Hazard Mitigation Plan was written in 2004. Since then, it has been revised twice. The current Plan in use is the 2017 update. With the 2022 update, the opportunity for a more current, dynamic, and accessible format has presented itself, which will be more readable as the move to a Whole Community approach continues.
2. There is a need for greater stakeholder/public involvement in the planning process and a transparent, coherent way to incorporate that involvement into the Plan.
3. More specific information on each municipality would be helpful in future planning. Collecting and summarizing each community's strengths and challenges in new and different ways will permit the Plan to reflect more comprehensive and accurate assumptions.
4. Municipal Threat/Hazard Identification and Risk Assessments (THIRAs) are indicating new threats, or new interpretations of threats, coming to the forefront even as some of the historical threats are decreasing.
5. The demographics section was more focused on social vulnerabilities than land use, and has been moved to risk assessment. This helps with ensuring social vulnerability risks and public protection are better addressed within the plan.
6. New sections on Climate change and Public Health Emergencies were needed.

With these and other considerations in mind, CCEMA made the decision to re-write the Plan, rather than revise the current, 2017 plan. Maps were moved to the risk section to highlight each community's critical infrastructure, risks, and vulnerabilities. More attention was focused on broader issues of mitigation strategy, in addition to the routine upgrades to prevent risks from magnifying. There should now be a better regional understanding of how one community's solution to a problem can have an impact on its neighbors. In addition, much of the supporting documentation is now in the Annexes with a summary in the Base Plan.

CCEMA has carefully followed FEMA's Update of the State and Local Mitigation Planning Policies process. The October 13, 2020 Mitigation Planning Policy Update Summary of Feedback provided guidance to the writing of the Mitigation Plan.

This plan, with these changes made, will create a stronger picture of current conditions, help the communities to prepare for future events, and lay the groundwork for recovery efforts before a disaster occurs.

Overview of the Multi-Agency Jurisdiction

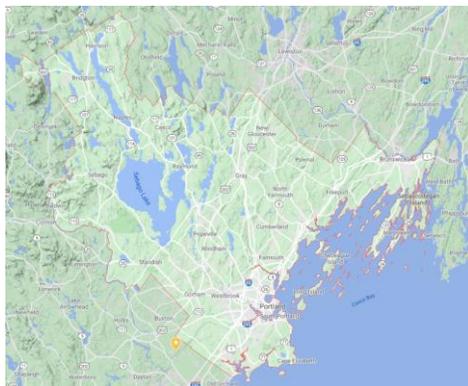
In order to understand the strengths and challenges in Cumberland County, Maine, one must first look at the State of Maine as a whole. Maine is located in the Northeast quadrant of the nation, and is the northernmost state in the Northeast. The State has a humid continental climate with four distinct seasons, each with its own challenges for emergency management and critical infrastructure.

Temperatures throughout the State typically range from summertime 80s to winters below 0° F (approximately 30 to -20° C).

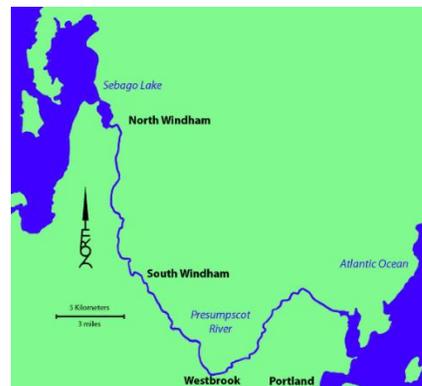
Maine is the “oldest” state, with an average population age of 45.1 ([Median Age in US](#)). As of 2019, 20.4% of Mainers were 65+ years of age ([US Census Quick Facts Cumberland County](#)). This means that there is a large number of more vulnerable older people whose needs must be taken into account in mitigation planning. Many parts of the State are sparsely settled and have fewer resources than other areas. The poverty rate is around 11%.

Maine is a “home rule/Dillon’s Rule” State, which means that the authority to act in local affairs is transferred from state law to local charters and shifts most of the responsibility of local government from state legislatures to the local community. Maine has been considered a strong “home rule” State since November 1969, when an amendment to the State constitution delegated broad “home rule” ordinance powers to cities and towns ([Maine Law Library: Maine Town Ordinances](#)) This means, in many cases, that State and County agencies can lead and recommend actions, but the authority lies with the towns. This is the case with emergency management.

Cumberland County (see the map with municipal boundaries in Appendix 3 Section 1), with a land area of 835 square miles, lies in the southwestern part of Maine, bordered by York, Oxford, Androscoggin, and Sagadahoc Counties and the Atlantic Ocean. The topography ranges from beaches, bluffs and rocky shorelines in the coastal communities to hilly terrain in the westernmost areas, with Sebago Lake dominating the west central part of the County. Sebago Lake is the second largest and one of the deepest lakes in the State. It provides drinking water to 11 Cumberland County communities. The Presumpscot River drains the lake and flows through Standish, Windham, Gorham, Westbrook, Portland, and Falmouth before emptying into Casco Bay at Falmouth. More information on the Presumpscot River is provided in the Risk Assessment Section of this Plan.



Map data ©2021 Google



Map courtesy of Wikipedia

Cumberland County’s temperatures tend to be milder than the more northerly areas of the state, but still average between 79°F in summer to 13°F in winter. (26° to -10° C) Historically, precipitation is generally above 3” per month all year ([US Climate Data Portland Maine](#)). See the breakdown of precipitation and temperature by month in Appendix 3 Section 1.

Within the County there are sufficient variations in precipitation and weather, that in March 2020 the National Weather Service instituted a third forecast zone for Cumberland County. (See the map and rationale in Appendix 3 Section 1.

The County has the largest population in Maine, with an estimated 295,003 out of a State population of 1,344, 212 as of 2019 ([US Census Quick Facts Cumberland County](#)). This is nearly 22% of the State population, making Cumberland County the most populous county in the State. There are three cities in Cumberland County: Portland (the largest city in Maine with a 2019 estimated population of 66,215 ([US Census Quick Facts Portland](#)), South Portland, and Westbrook, and 25 towns. One of those towns, Frye Island, is a seasonal town, only inhabited mid- April through October.

Town	Population 2019	% increase since 2010	Households	Bachelors degree+	Disability	Persons 65+	Language other than English used in home	Poverty Level	Median household Income	Median monthly housing cost with mortgage	Median monthly Rental cost
Baldwin	1,506	-8.9%	N/A	15%	19.4%	18.4%	0.5%	14.0%	\$59,261	N/A	N/A
Bridgton	5,382	3.8%	2,449	33.7%	10.8%	23.9%	3.7%	10.8%	\$56,483	\$1,122	\$938
Brunswick	20,517	-0.19%	6256	48%	14.5%	21.4%	7.2	8.9%	\$59,292	\$1,122	\$938
Cape Elizabeth	9,275	2.4%	3,570	72.7%	7.6%	22.3%	3.7%	4.1%	\$123,116	\$2,303	\$1,199
Casco	3,920	5.6%	1,554	25.7%	14.3%	21%	0.9%	15%	\$61,667	N/A	N/A
Chebeague Isl.	449	2.3%	N/A	50.9%	12.9%	42.1%	0.7%	7.1%	\$68,333	N/A	N/A
Cumberland	7,998	11.6%	2,878	69.2%	8.1%	17.5%	8.7%	4.1%	\$111,890	\$2,301	\$1,183
Falmouth	12,141	9.5%	4,727	67.0%	7.2%	18.7%	4.6%	2.7%	\$121,285	\$2,402	\$1,701
Freeport	8,439	6.9%	3,447	55.2%	5.0%	18.2%	2.6%	2.2%	\$86,128	\$1,731	\$1,329
Frye Island*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gorham	17,582	9.4%	6,021	43.6%	11.9%	13.9%	3.5%	5.7%	\$84,767	\$1,802	\$1,073
Gray	8,117	6.4%	3,478	49.8%	6.7%	18.7%	3.8%	5.7%	\$81,922	\$1,670	\$1,120
Harpswell	4,898	1.0%	N/A	50.1%	12.4%	34.8%	2.8%	6.7%	\$40,611	N/A	N/A
Harrison	2,795	5.0%	N/A	23.6%	14.8%	24.4%	3.9%	13.3%	\$51,397	N/A	N/A
Long Island	314	20.3%	N/A	53.4%	12.4%	28.3%	1.7%	9.2%	\$80,556	N/A	N/A
Naples	3,957	4.5%	N/A	25.5%	10.9%	20.9	2.2%	12.6%	\$67,935	N/A	N/A
New Gloucester	5,738	5.7%	N/A	30.5%	11.2%	11.1%	5.6%	8.8%	\$74,769	N/A	N/A
North Yarmouth	3,779	7.5%	N/A	58.8%	7.8%	11.9%	1.9%	4.2%	\$113,994	N/A	N/A
Portland	66,595	.69%	30,422	52.6%	12.3%	14.8%	13.2%	14.6%	\$60,467	\$1,830	\$1,124
Pownal	1,635	8.1%	N/A	44.1%	6.7%	19.8%	2.1%	4.6%	\$88,250	N/A	N/A
Raymond	4,500	1.9%	N/A	43.5%	6.5%	19.1%	1.3%	5.0%	\$76,579	N/A	N/A
Scarborough	20,146	8.1%	8,101	54.5%	10.3%	22.1%	6.4%	4.5%	\$94,905	\$2,126	\$1,206
Sebago	1,600	9.4%	N/A	27.3%	18.4%	25.9%	1.5%	6.7%	\$57,902	N/A	N/A
South Portland	25,548	3.0%	10,856	45.7%	12%	16.7%	11.6%	8.8%	\$69,290	\$1,699	\$1,305
Standish	10,078	2.7%	3,402	30.7%	11.3%	15%	2.5%	7.2%	\$74,688	\$1,549	\$1,182
Westbrook	18,633	7.6%	8,073	32.3%	14.4%	17%	8.3%	16.3%	\$59,460	\$1,514	\$1,030
Windham	18,195	9.0%	6,786	33.8%	9.5%	15.4%	4.9%	6.5%	\$78,284	\$1,613	\$1,067
Yarmouth	8,529	1.6%	3,409	67.3%	9.7%	22.1%	3.4%	3.4%	\$89,984	\$2,281	\$1,227

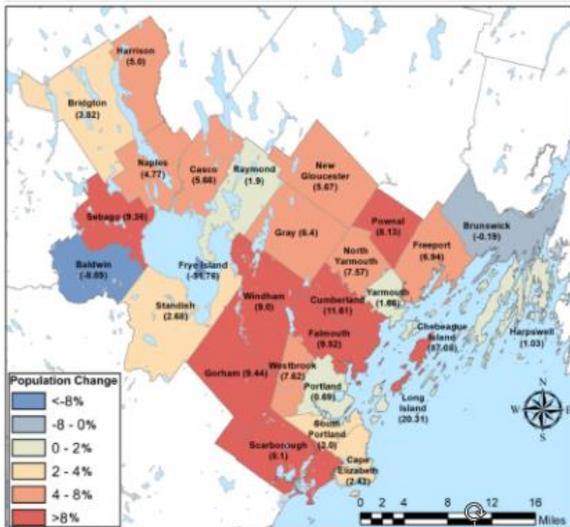
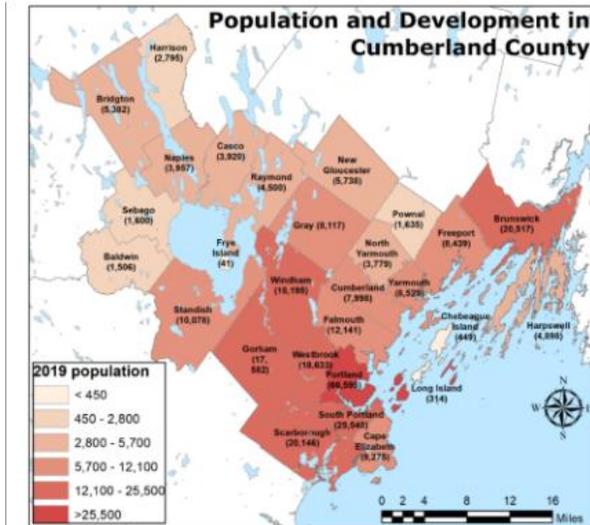
U.S. Census Bureau (2019 estimates). Census QuickFacts. [census.gov/quickfacts](https://www.census.gov/quickfacts) and [Census Data](#)

N/A Not available

*Frye Island is a “part-time town”, only open late April – October 31 each year. No permanent residents. Census data is unreliable.

The population for most of the municipalities reflects permanent residents only. For many of these jurisdictions, the population can swell to much larger numbers during the summers.

Financial data is pre-COVID, and may not reflect current conditions.



Population (top) and percent population change from 2010-2019 (bottom) of jurisdictions in Cumberland County (2019 American Community Survey). Map courtesy Samuel Roy, Maine Emergency Management Agency Natural Hazards Planner.

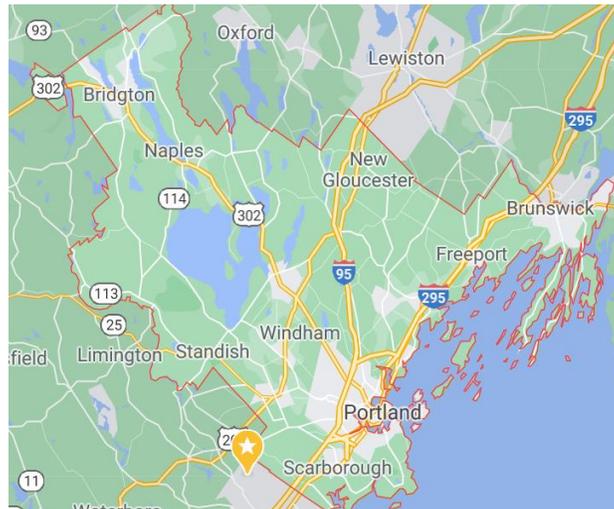
Town	Population 2019	% increase since 2010	Projected % Change in Population: 2018-2023	Projected % Change in Population: 2023-2028
Baldwin	1,506	-8.9%	0.2%	0.2%
Bridgton	5,382	3.8%	-1.6%	-1.8%
Brunswick	20,517	-0.19%	-2.2%	-2.4%
Cape Elizabeth	9,275	2.4%	-0.8%	-0.9%
Casco	3,920	5.6%	0.2%	-0.1%
Chebeague Isl.	449	2.3%	-0.6%	-0.9%
Cumberland	7,998	11.6%	9.0%	7.9%
Falmouth	12,141	9.5%	3.7%	3.2%
Freeport	8,439	6.9%	2.2%	2.1%
Frye Island*	N/A	N/A	0.0%	0.0%
Gorham	17,582	9.4%	2.7%	2.7%
Gray	8,117	6.4%	1.9%	1.8%
Harpswell	4,898	1.0%	-0.5%	-0.5%
Harrison	2,795	5.0%	-2.4%	-2.5%
Long Island	314	20.3%	-0.8%	-0.8%
Naples	3,957	4.5%	-1.8%	-2.0%
New Gloucester	5,738	5.7%	0.7%	0.9%
North Yarmouth	3,779	7.5%	1.4%	1.5%
Portland	66,595	.69%	-2.6%	-2.9%
Pownal	1,635	8.1%	1.4%	1.3%
Raymond	4,500	1.9%	-1.8%	-1.8%
Scarborough	20,146	8.1%	2.6%	3.0%
Sebago	1,600	9.4%	1.7%	1.6%
South Portland	25,548	3.0%	-1.7%	-1.6%
Standish	10,078	2.7%	-2.2%	-2.2%
Westbrook	18,633	7.6%	5.4%	5.2%
Windham	18,195	9.0%	4.3%	4.0%
Yarmouth	8,529	1.6%	-2.2%	-2.1%

U.S. Census Bureau [census.gov/quickfacts](https://www.census.gov/quickfacts)
 Population projections: **Maine State Economist**
 Maine Population Outlook 2018-2028
 N/A Not available

Census-derived population trends indicate substantial growth in towns adjacent to the city of Portland. The Maine State Economist’s report on the Maine Population Outlook 2018-2028 suggests that this trend will continue beyond the five-year period of this Hazard Mitigation Plan, potentially indicating more need in hazard mitigation actions for these growing regions. Refer to Section 5: Mitigation Strategy for a list of county and local jurisdiction mitigation actions and projects.

The County is considered to be the economic and industrial center of Maine, with its healthcare, social services, financial, and retail sectors. It is served by the Port of Portland which is the second largest oil port on the East Coast and the largest tonnage seaport in New England.

Major roads include I-95, I-295, US routes 202, 302, 1, Maine State Routes 9, 25, 77, and 114. In addition, the county is served by Amtrak which runs from Boston MA to Brunswick, ME. Portland International Jetport (PWM) is the largest airport in Maine with over 2 million passengers in 2019.



Map data ©2021 Google

Rationale for Multi-Jurisdictional Plan

The State of Maine has chosen to have the Five-Year Hazard Mitigation Plans written at the County level for the following reasons:

- Many of Maine's towns are small and rural and do not have personnel, budget, or time to write their own plans
- Maine is working toward looking more regionally at its mitigation planning so that what one town considers for a mitigation project does not unintentionally create a problem for another town
- It allows the counties to have a better understanding of each town's challenges so that training and exercises can be formulated to assist the municipalities.

Section 2: Adoption

Requirement §201.6(c)(5):	Documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County commissioner, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.
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Pending FEMA Preliminary Approval. The signature pages will form Appendix 1.

Section 2a County Adoption

Section 2b Municipal Adoptions

Section 3: Planning

Requirement §201.6(a)(4):	Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process, and has officially adopted the plan.
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Multi-Jurisdictional Planning

In Maine, the sixteen counties file multi-jurisdictional plans covering the towns and cities within their borders. Every effort is made to engage each community in the planning efforts and in covering the strengths and challenges each municipality faces.

Additionally, with the ability to look at several communities from a broader perspective, the counties can work with multiple towns to address these more regional hazards.

Requirement §201.6(b):	<p>In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:</p> <ol style="list-style-type: none"> (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval; (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and (3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information. <p>NB: numbering added for clarity in following text</p>
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(1) §201.6(b): Public Comment Opportunities

CEEMA recognizes the importance of public input in the Hazard Mitigation plan process. Before final review by MEMA, it was posted on the County EMA website and CEEMA’s Facebook and Twitter accounts to encourage public comment. After MEMA review, the plan was updated on the website for comments again. A public meeting was planned to allow people to ask questions and to encourage participation in their community hazard mitigation planning in mid-2021 (COVID restrictions dependent).

Note: See Appendix 3 Public Participation for the survey, analysis and other documentation.

After the draft plan was completed, CEEMA hosted a virtual meeting for public comment in June 2021. A press release was issued and the meeting was announced on social media. Notwithstanding, there were only two participants. Areas of concern highlighted were increasing heat due to climate change, coastal changes, again due to climate change, and how best to reach out to the community through

social media. The social media suggestions will be brought to the new social media intern to begin work on during the summer of 2021. The other comments were acknowledged as being of concern to CCEMA as well, as evidenced by the Plan.

Note: See Appendix 3 Public Participation for the social media posts and the press release for this event. A link to the recording can be found at [Public Comment Meeting recording](#)

(2) §201.6(b): Neighboring Communities, Academia, Businesses and Other Participation

In November 2020, emails were sent to neighboring counties asking for their input concerning cross-boundary threats and vulnerabilities. Neighboring County EMA Directors were requested to disseminate these questions to the municipalities that border Cumberland County. Sagadahoc County responded with one comment beyond the scope of this plan, and a second comment that will require further study.

In addition, emails were sent to area businesses that have an impact on the environment, non-profits, State agencies with jurisdictional control in a part of the County, and a non-profit organization affiliated with the University of Southern Maine. Because of the constraints caused by the COVID public health restrictions, none were able to participate.

CCEMA relied heavily on a THIRA produced by the Gray office of the National Weather Service for the Cumberland County area.

Maine Emergency Management Agency participated in the plan design and produced several ARCGIS maps for use in the plan, resulting in better graphical presentation of materials. The State Hazard Mitigation Officer was very helpful in guiding CCEMA in the plan writing stage, as well as in the State review of the Plan.

Note: See Appendix 3 Neighbors for supporting documentation.

(3) §201.6(b): Review and Incorporation of Plans, Studies, Reports

CCEMA used many plans and studies in support of the County and municipal risk assessments. The most notable of these are listed below:

Plan/Study/Report	National scope	State scope	County scope	Local Scope
Northeast States Emergency Consortium (NESEC) Hazard reports			X	
Maine's Climate Future 2020		X		
Maine four year Plan for Climate Action		X		
2019 Maine State Hazard Mitigation Plan		X		
National Weather Service (NWS) Gray THIRA			X	
6 th International Climate Assessment Report	X			
5 th International Climate Assessment Report	X			

Plan/Study/Report	National scope	State scope	County scope	Local Scope
Cumberland County Hazard Mitigation Plan 2017			X	
Portland’s 2017 Comprehensive Plan				X
Portland’s Recode Overhaul				X
Windham’s Growth Plan				X
Westbrook’s Comprehensive Plan				X

Social Vulnerability indices helped to pinpoint areas of high socioeconomic risk. Virtual classes, conference materials and presentations rounded out the research reviewed and/or incorporated in this Plan.

Note: See Appendix 3 Review and Incorporation of Plans, Studies, Reports for a list of all material used.

Requirement §201.6(c)(1):	The plan shall include: documentation of 1) the planning process used to develop the plan, including 2) how it was prepared, 3) who was involved in the process, and 4) how the public was involved. NB: numbering added for clarity in following text
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(1) §201.6(c)(1): Planning Process

The planning framework for the 2022 Cumberland County Hazard Mitigation Plan was set in early January 2020 with a gathering of stakeholders. Representatives from 16 towns, a neighboring community and county, Maine government, Greater Portland Council of Governments, and the Greater Portland Board of Realtors participated. This early gathering allowed CCEMA to glean preliminary information on the extent of knowledge of stakeholders, generate interest in participation in the planning, and to meet stakeholders who were new to collaborative mitigation planning.

A timeline was approved, and other planning meetings were scheduled. However, shortly after the January meeting, most of the local EMA directors and town officials were inundated with COVID-19 response activities, and public meetings were no longer allowed per public health restrictions. Because of the heavy burden on the local leadership and the need to push forward, the de facto planning group became composed of several CCEMA staff, with draft sections being sent to the stakeholder group for comments and revisions.

Note: See Appendix 3 Planning Process for documentation

(2) §201.6(c)(1): How the Plan was Prepared

CCEMA decided to write the Plan in-house, with the assistance of the local municipalities and reaching out to old and new partners to gather the data necessary for research and comment. Editing was done in-house and with a volunteer, with a focus on ensuring its readability and transparency to the public.

Before submitting for review, the plan was distributed to all partners and to the public via the CCEMA website. For the public, announcements of its posting were made on Twitter and Facebook so the public was alerted to the request for comment.

(3) §201.6(c)(1): Municipal Involvement in Planning

CCEMA took a two-pronged approach to gathering information from the local municipalities. First was the Local Capability Assessment, modeled after the one used in the Catabwa County et al (NC) Mitigation plan ([Unifour Regional Mitigation Plan](#)). This survey collected information on current regulations, policies and programs in each of the 28 towns/cities. A summary of that assessment, along with the questions and a spreadsheet of responses is available in Appendix 3 Municipal Participation.

The second approach to gathering municipal information involved another Google form, emails and phone calls to local EMA directors seeking detailed information on each town's threats, vulnerabilities, strengths, and gaps, as well as their mitigation project updates as listed in Section 5. This will be accomplished by such actions as adopting official sea-level rise projections, incorporating climate change in land-use planning and strengthening public-health monitoring, education and prevention.

There are several initiatives within the State of Maine and the Cumberland County area, which are and will be important to mitigation planning in the near future. Maine Won't Wait is a climate initiative that may have far ranging effects on flooding, extreme temperature mitigation, and protecting Maine's fragile ecosystems.

Two Cumberland County towns, Windham and Bridgton, are part of a pilot program supported by the Maine Climate Council to develop climate resilience plans. The project involves developing planning models for mitigating and adapting to climate change. ([Mainebiz June 2, 2021](#))

The Cumberland County Soil and Water Conservation District provides technical assistance to municipalities concerning a host of mitigation projects. For Instance, CCSWCD provided planning and technical assistance to Buston's Island (a community within Freeport) to mitigate a storm water runoff problem

There are eighteen land trust organizations in Cumberland County. This is important to the acquisition and management of public lands to provide conservation easements, protect water supplies, and to educate the public.

Greater Portland Council of Governments (GPCOG) provides cost-saving engineering consultants for storm water management projects, among other consulting services to towns within its coverage area.

There are numerous other collaborations and initiatives in the Cumberland County area that deal with preparedness, planning and mitigation. This provides Cumberland County with a range of services and cooperation that serves to complement and enhance planning done by CCEMA.

Table 1: Summary of Local Mitigation Plan Participation by Municipal/Method

Municipality	Phone	Email	Local Capability Assessment Survey	Meetings	Annual updates (years reported)	Letter received by Town Officials	Municipal Mitigation Survey
Baldwin	X	X	X		1	X	X
Bridgton	X	X	X	X	2	X	X
Brunswick	x	X	X	X	4	X	X
Cape Elizabeth	x	X	X	X	2	X	X
Casco	X	x	X		1	X	X
Chebeague Island	X	X	X		2	X	X
Cumberland		X	x	X	2	X	X
Falmouth	x	X	X	X	3	X	X
Freeport	x	X	x		4	X	X
Frye Island	X	x	x		0	X	
Gorham	X	X	x	X	1	X	X
Gray	x	X	X	X	3	X	X
Harpswell	x	X	X	X	4	X	X
Harrison	x	X	X		4	X	X
Long Island	X	x			0	X	X
Naples	x	x	X	X	4	X	X
New Gloucester	x	X	x		3	X	X
North Yarmouth	x	X	X	X	4	X	X
Portland	x	X	X	X	3	X	X
Pownal	X	X	X	X	2	X	X
Raymond	x	X	X	X	1	X	X
Scarborough	x	X	X	X	4	X	X
Sebago	X	X	X	X	4	X	X
South Portland		X	X	X	4	X	X
Standish		X	x		3	X	X
Westbrook	X	X	X	X	2	X	X
Windham	x	X	X		2	X	X
Yarmouth	x	X	X	X	3	X	X

Table 2: Planning Process Participants

Name	Position	Municipality
Matt Mahar	Director, CCEMA	Cumberland County EMA
Emily Kaster	Deputy Director, CCEMA	Cumberland County EMA
Margaret Cushing	Planner	Cumberland County EMA
Ron Jones	Project Coordinator	Cumberland County EMA
Chris Wheeler	LEPC Liaison	Cumberland County EMA
Arn Hegggers	T&E Coordinator	Cumberland County EMA
Chelsea Robbins	Intern	Cumberland County EMA
Serena Joyce	Volunteer Editor	Cumberland County
Anne Fuchs	Director of Mitigation, Planning, and Recovery	MEMA
Samuel Roy	Natural Hazards Planner	MEMA
Heather Dumais	State Hazard Mitigation Officer	MEMA
Danielle Taylor	Local EMA Director (former)	Baldwin
Owen Sprague	Local EMA Director	Baldwin
Todd Perreault	Local EMA Director	Bridgton
Ken Brilliant	Fire Chief/EMA Director	Brunswick
Jay Astle	Public Works Director	Brunswick
Charlie Kennedy	EMA Director	Cape Elizabeth
Jay Reynolds	Public Works Director	Cape Elizabeth
Don Gerrish	Interim Town Manager	Casco
Brian Cole	EMA Director	Casco
Justin Poirier	Town Administrator	Chebeague Island
Ralph Munroe	Fire Chief/EMA Director	Chebeague Island
Dan Small	Fire Chief/EMA Director	Cumberland
Howard Rice	Fire Chief/EMA Director	Falmouth
Colin Shea	EMA Fire Captain	Falmouth
Charles Jordan	Fire Chief/EMA Director (former)	Freeport
Paul Conley	Interim EMA Director	Freeport
Bill Braun	Town Manager	Frye Island
Robert Boyd	EMA Director	Frye Island
Ken Fickett	Fire Chief/EMA Director	Gorham
Robert Burns	Public Works Director	Gorham
Thomas Poirier	Director of Community Development	Gorham
Kurt Elkanich	Fire Chief/EMA Director	Gray
Alec Dodd	Public Works	Gray
Art Howe	Fire Warden/EMA	Harpswell
Ray LaPlante	EMA Director	Harrison
Brian Dudley	Town Administrator	Long Island
William Tierney	Fire Chief/EMA Director	Long Island
John Hawley	Town Manager	Naples
Ephrem Paraschak	EMA Director	Naples
Toby Martin	Fire Chief/EMA Director (former)	New Gloucester
Craig Bouchard	EMA Director	New Gloucester
Greg Payson	Fire Chief/EMA Director	North Yarmouth

Keith Gautreau	Fire Chief	Portland
Caity Hager	Emergency Management Coordinator	Portland
Brad Roland	Senior Project Engineer, DPW	Portland
Troy Mooney	Sustainability Coordinator	Portland
Nancy Gallinaro	Water Resources Manager, DPW	Portland
Jesse Peters	Fire Chief/EMA Director	Pownal
Bruce Tupper	Fire Chief/EMA Director	Raymond
B. Mike Thurlow	Fire Chief/EMA Director	Scarborough
Michele Bukoveckas	Town Manager	Sebago
Jason Schoolcraft	Fire Chief/EMA Director (former)	Sebago
Phil Strike	EMA Director	Sebago
James Wilson	Fire Chief/EMA Director	South Portland
Doug Howard	Director of Public Works	South Portland
Kevin Adams	Director of Parks, Rec & Waterfront	South Portland
Robert Caron	EMA Dir/Dir of Public Safety	Standish
Roger Mosley	Director of Public Works	Standish
Greg Hamilton	EMA Director	Westbrook
Eric Dudley	Director of Public Works	Westbrook
Daniel Stevenson	Economic Development Director	Westbrook
Brent Libby	Fire Chief/EMA Director	Windham
Michael Robitaille	Fire Chief/EMA Director	Yarmouth

(4) §201.6(c)(1): Public Participation

CCEMA was committed to providing opportunities for public participation in the 2022 Plan. This began with planning in late January 2020 for a public meeting to discuss and educate people about mitigation and to have open discussions about their concerns. However, because of the social distancing and lockdowns required by the COVID-19 response, CCEMA was not able to execute its public participation gathering that was planned for mid-May 2020. It was intended as a lead-in to the Public Participation Survey that was posted on the County EMA website.

The Public Participation survey was modeled on the template in the FEMA Local Mitigation Planning Handbook (Worksheet 3.1) but modified to reflect some questions pertinent to Cumberland County. It was posted to the CCEMA website. This survey was advertised on CCEMA’s Facebook and Twitter accounts and a press release was sent out.

Note: Supporting documentation is located within Appendix 3 Public Participation

Using the information gathered from the survey, several additions were made to the County Mitigation strategy, which are highlighted in Section 5.

Requirement §201.6(c)(4)(iii):	The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.
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General plan maintenance information is provided in Section 6 Maintenance.

Public Participation continuity: CCEMA will continue to use its social media presence to gather comments on the progress of the municipal strategies and new areas of vulnerabilities and to encourage public input into local mitigation planning and projects.

Providing information on mitigation efforts such as building code updates, community resilience and the need for a whole community approach can build support at the local level for increased mitigation dollars to complete the projects listed in the Strategy Section of the Plan.

Additionally, dependent upon public health restrictions, CCEMA will participate in local fairs and other events to converse with eventgoers about the Plan and the importance of mitigation planning beginning at the personal level. Information on flood insurance, FireWise, and other programs will be provided as pertinent.

Section 4: Hazard Identification and Risk Assessment

Introduction

In the 2017 Mitigation Plan, the primary risks were identified as being:

- Flooding
- Severe summer weather, including severe thunderstorms, hurricanes, tornadoes, windstorms, drought and excessive heat
- Severe winter weather, including blizzards, heavy snowstorms, and ice storms
- Wildfire
- Coastal erosion

For the 2020 Plan, several changes were made as current information became available and the 2020 Cumberland County THIRA results were tabulated. (The complete THIRA can be found in Appendix 3 Risk Assessment). Towns which participated in the 2020 THIRA were Falmouth, Gray, Harrison, Portland, Scarborough, and South Portland.

Using the Risk Assessment Tool supported by the Maine Emergency Management Agency, each possible hazard was rated on a scale of one to five, as to Likelihood and Vulnerability. Composite scores were aggregated to arrive at the most likely hazards.

Using the information in the THIRA, the highest prevalence hazards now include (by total score):

- Severe winter weather (7)
- Severe summer weather (6)
- Flooding (5)
- Hurricane (5)
- Erosion/Coastal Flooding (5)
- Disease Outbreak (5)

Even though Landslides rated only a 3 on the THIRA, an incident in Westbrook in September 2020 necessitated that this hazard, too, be profiled in the 2022 Plan.

For the purposes of the 2022 Plan, the categories to be described in this plan are: severe winter weather (blizzards, nor'easters, ice storms), severe summer weather (hurricanes, tropical storms, severe thunderstorms, tornados, windstorms, drought), flooding (riverine, coastal including coastal erosion). Landslides have been added as a result of a large landslide on the Presumpscot River in 2020. Public Health emergencies are covered in Annex 2, Infectious Diseases.

Annex 1 details a summary of Climate Change in Southern Maine and the effects it has had and will continue to have on the health, incomes, and way of life of Mainers.

After reviewing the County THIRA and in repeated conversations with fire chiefs, wildfire is not considered a primary concern in the 2022 Plan for a number of reasons. This is confirmed by the NWS THIRA slide below. The devastating 1947 fires are considered the fires of record in southern Maine, but there have been no instances since then, of the same magnitude. Fire departments are better prepared, through training, equipment, communications, and prevention activities. The Maine Forest Service plays a primary role in fighting forest fires.

“Through upgraded training, improved field communications and the reliance on an air fleet to knock down fires quickly, acreage lost to wildfires has been reduced to about 400 acres annually.” [Maine Forest Service](#)

Maine topography does not support the sort of wildland fires seen in the Western United States, and the majority of fires in Maine are seen in April and October. The areas west of the I95 Interstate corridor are most likely to be impacted as they are more heavily forested.

Wildfires

- Wildfires are highly likely but are normally confined to 2 seasons (April and late summer) and are small in size < 1 acre on average.
- Historical fire patterns like 1947 are unlikely generational events.
- On average receptive fuels and fire weather conditions align to create “potential” explosive fire growth days 2 times per year (almost always in April).

Likelihood Scale	
1	Unlikely
2	Somewhat Likely
3	Likely
4	Highly Likely
5	Certain

Wetly Avg: 17 Mar 2010 and 22 Sep 2009 Red Flag Warning (FWW)
 Plotted for Maine, based on IEM Analysis

Slide from NWS Gray Maine “Cumberland County THIRA 2020
 Dumont, Warning Coordination Meteorologist

This downgrading of the risk from wildfires is for this 2022 plan only, and will be reassessed in light of climate changes in the future. With this in mind, CCEMA has included data on wildfires in Annex 3 – Non-Profiled Hazards to keep the information at hand, at the recommendation of, and in agreement with, the State Natural Hazards Planner. See Annex 3 Hazards Not Profiled for further information.

Hazard Descriptions

Requirement §201.6(c)(2)(i):	The risk assessment shall include a description of the <u>type</u> , <u>location</u> and <u>extent</u> of all natural hazards that can affect the jurisdiction. The plan shall include information on <u>previous occurrences</u> of hazard events and on the <u>probability of future hazard events</u> . (Underlining added for emphasis)
Requirement §201.6(c)(2)(ii)	The risk assessment shall include a] description of the jurisdiction’s <u>vulnerability</u> to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its <u>impact</u> on the community. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods.

Severe winter weather is the top concern of both local emergency managers and the public of Cumberland County. According to the Maine Emergency Management Agency’s website: “Severe winter weather conditions are typically characterized by low temperatures, strong winds, and large quantities of snow. According to the Maine State Hazard Mitigation Plan, these storms include:

- **Blizzard:** Sustained winds of 40 miles per hour (mph) or more (or gusting up to at least 50 mph) with heavy falling or blowing snow, persisting for one hour or more, temperatures of ten degrees Fahrenheit or colder and potentially life-threatening traveling conditions.
- **Heavy Snow Storm:** A snowfall of 15 inches or more within 12 to 24 hours which disrupts or slows transportation systems and public safety departments' response capability.
- **Ice Storms:** Rain which freezes upon impact. Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires, and similar objects to produce widespread power outages.
- **Nor'easter:** Nor'easters are extratropical coastal storms that can produce tremendous amounts of precipitation and strong winds that can cause coastal flooding damage. When the precipitation is in the form of snow, sleet or freezing rain, it can damage overhead utility lines and become a highway driving hazard.
- **Sleet Storm:** Frozen rain drops (ice pellets) which bounce when hitting the ground or other objects. Sleet does not stick to objects but produces hazardous driving conditions in accumulated depths of two inches or more.

Type	Location	Probability	Source
Blizzards and Nor'easters	Depends on storm track but any part of county is susceptible	Certain	NWS records MEMA Hazard Mitigation Plan Local historical knowledge
Heavy snow storm	All locations in county	Certain, Multiple times per winter	NWS records MEMA Hazard Mitigation Plan Local historical knowledge
Devastating Ice Storms	Depends on storm track but any part of county is susceptible	About once every 20 years	NWS MEMA Hazard Mitigation Plan Local historical knowledge
Minor ice storms	Mostly along the coastal areas, but may also be inland	Approximately every other year	Local historical knowledge News articles

Type: Blizzards and heavy snow storms

Blizzards and heavy snow storms are considered a yearly event in Cumberland County. Heavy snowstorms tend to have a limited impact other than adversely affecting travel.



Photo Dec. 17, 2020 by C. Wheeler
Near Gorham, Maine. Used by
permission

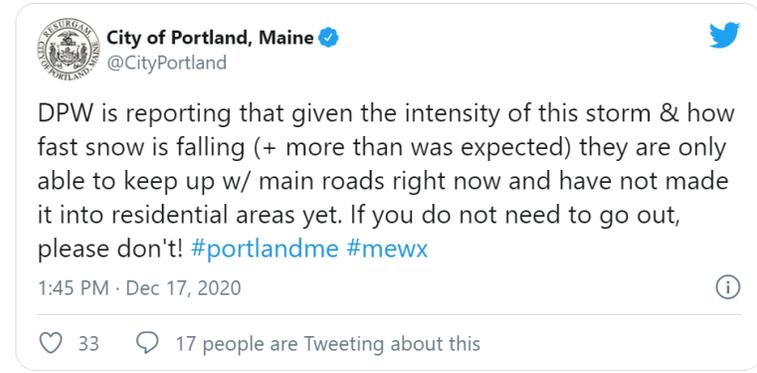
Location: Blizzards and snowstorms are a hazard throughout the County and depending on the storm track can affect all municipalities in varying degrees. The National Weather Service Gray Maine recognized this in a statement introducing the addition of a third weather zone for Cumberland County with this statement: “The goal of this zone change is to better group areas with similar climatological conditions. For example, there are numerous winter storms in which condition in Bridgton are significantly different to those in Windham.” (Appendix 3 Introduction to the Mitigation Plan)

A coastal storm may impact areas to the east of the Interstate 295 corridor, which parallels the coastline, while leaving interior areas with little effect. These storms are more likely to raise the risk of coastal flooding and splash over, which will be detailed in the section on Flooding.

Extent: The snowfall season has historically run from November to April. Total snowfall ranges for the season average between 50-90 inches, but averages around 69”. All areas are susceptible to blizzards and heavy snowfall.

Impact: The impact of blizzards and heavy snowstorms is dependent upon storm track, wind speeds, and water content of the snow. Because of the higher altitudes of the interior section of the County, there is a greater likelihood of snow than more liquid precipitation for many storms. However, wind speeds, especially in blizzards, and water content play a very important role in the extent of impact throughout the County. On average, **thirteen inches** of snow equals **one inch** of rain in the US, although this ratio can vary from **two inches** for sleet to nearly **fifty inches** for very dry, powdery snow under certain conditions. ([National Severe Storms Laboratory](#)) The heavier the weight of the snow, the more damage is possible

Depending on the water content of the snow, a heavy snowstorm may be merely a nuisance or a more serious concern. For instance, the heavy snow storm of December 17, 2020 dumped up to two feet of snow in Cumberland County, but the water content at the Portland Jetport, which reported 17.6” of snow, held only .5 inches of water. The storm created difficult driving conditions, but little other damage. Portland Public Works tweeted this during the storm, which highlights the difficulties of clearing roads in a metropolitan area during a heavy snow event.



Heavy Snow Load

- Heavy snow load is caused by active winter patterns creating excessive snowpack on infrastructure.
- Historical “30 day” snow periods in Portland
 - January 1923 – 69.6”
 - February 1969 – 66
 - February 2015 – 65.8”
- Heavy wet snow load on trees leading to utility outages is “highly likely” with a good event every other year.

Likelihood Scale	
1	Unlikely
2	Somewhat Likely
3	Likely
4	Highly Likely
5	Certain

Heavy wet snow brings down trees, power lines, and, in some cases, causes structural damage to buildings. A blizzard, with winds of 40+ mph can create whiteout conditions for travelers and first responders. Many first responder departments and electrical utility companies have upper limits of safety for driving in high winds and may not be able to respond to an incident. The National Fire Protections Association (NFPA) recommendation is to cease operations for high profile vehicles, such as fire trucks, at 45 mph.

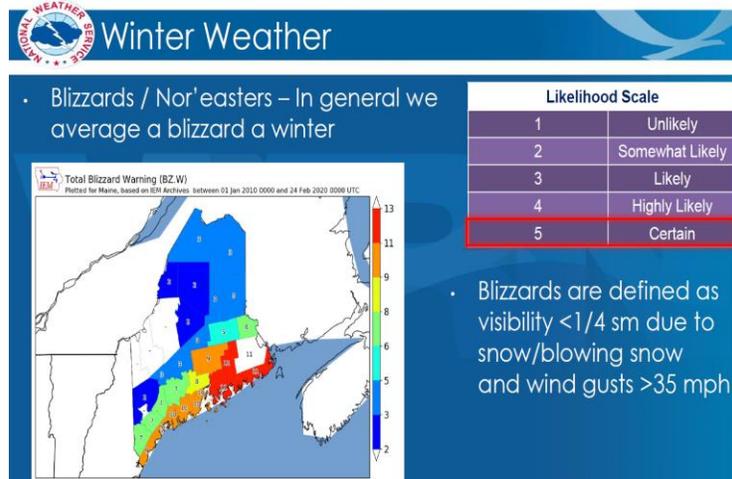
Previous Occurrences: Historical blizzard/heavy snow occurrence affecting Cumberland County since 2000 that have been especially impactful, are listed in the State Mitigation Plan, excerpted to focus on events in Cumberland County, below.

Date	Year	County(ies)	Damage (As noted in Declaration)	Declaration
March 5-31	2001	Androscoggin, Aroostook, Cumberland, Franklin, Hancock, Lincoln, Oxford, Penobscot, Piscataquis, Sagadahoc, Somerset, Washington, York	\$4,483,918 Maine severe winter storm.	Presidential FEMA-3164-EM-ME
Dec 17 2002 - Jun 1, 2003	2003	Androscoggin, Cumberland, Franklin, Hancock, Kennebec, Lincoln, Oxford, Penobscot, Piscataquis, Washington	\$2,144,457 Maine Extreme winter weather; severe cold deep and frost; the “frozen pipes” disaster	Presidential Declaration
Dec 6-7	2003	Aroostook, Cumberland, Franklin, Hancock, Kennebec, Oxford, Penobscot, Piscataquis, Somerset	\$1.7 million Maine snow, winter storms, and extreme cold	Presidential FEMA-3190-EM-ME

Jan 22-23	2005	Cumberland, York	\$10 million Maine snow, winter storms, extreme cold	Presidential FEMA-3205-EM-ME
Feb 10-11 Nor'easter	2006	Androscoggin, Aroostook, Cumberland, Franklin, Hancock, Knox, Oxford, Penobscot, Piscataquis, Somerset, York	\$10 million Maine snow, winter storms, and extreme cold	Presidential FEMA-3206-EM-ME
March 9	2005	Androscoggin, Aroostook, Cumberland, Franklin, Hancock, Oxford, Penobscot, Piscataquis, Somerset, York	\$10 million Maine snow, winter storms, and extreme cold	Presidential FEMA-3209-EM-ME
March 11	2005	Androscoggin, Cumberland, Oxford	\$10 million Maine snow, winter storms, extreme cold	Presidential FEMA-3210-EM-ME
Feb 8-9 Nor'easter	2013	Androscoggin, Cumberland, Knox, Sagadahoc, Washington, York	Severe winter storm (blizzard)	Presidential FEMA-4108-DR-ME
Jan 26-28 Nor'easter	2015	Androscoggin, Cumberland, Sagadahoc, York	Blizzard that closed state and town offices. Highways were treacherous due to winds and drifting snow	Presidential FEMA-4208-DR-ME
Feb 13 Nor'easter	2017	Statewide	Blizzard closed state and town offices. Public was warned to avoid any unnecessary travel which made snow removal efforts timely	N/A
March 14	2017	Statewide	Blizzard conditions along the coast and heavy snow fell throughout the state. School and meeting cancellations. State offices closed at 2PM	N/A

(from the Maine State Mitigation Plan (Rev. Oct 2019) pp3-43 - 3-48)

Probability of Future Occurrences: The National Weather Service 2020 Cumberland County THIRA provides some further information and the likelihood of these events in our County.



Type: Ice Storms

According to weather.com, “ice storms occur when freezing rain accumulates on surfaces and on the ground. Freezing occurs when air warmer than the freezing mark above the ground moves over subfreezing air near the ground. When snow aloft falls through the warmer layer it melts into rain. Then, as the rain droplets fall into the shallow layer of subfreezing air, the droplets freeze upon contact. This creates a glaze of ice... In most areas of the U.S., an ice storm typically refers to events where a quarter-inch of ice accumulation occurs producing a significant and possibly damaging accretion of ice. If less than a quarter-inch of ice is produced, it's usually more of a nuisance event with less severe impacts.” The article goes on to state that “When a quarter-inch or more of ice builds up, severe impacts can result. Ice can increase the weight of tree branches up to 30 times and can add 500 pounds of extra weight to power lines. Consequently, tree branches, power lines and power poles can fall.

[Weather Explainer](#)

Location: Any part of the County is susceptible to ice storms, but the coastal areas, because of the proximity to the Atlantic Ocean, are more likely to sustain mini-ice storms every two to three years.

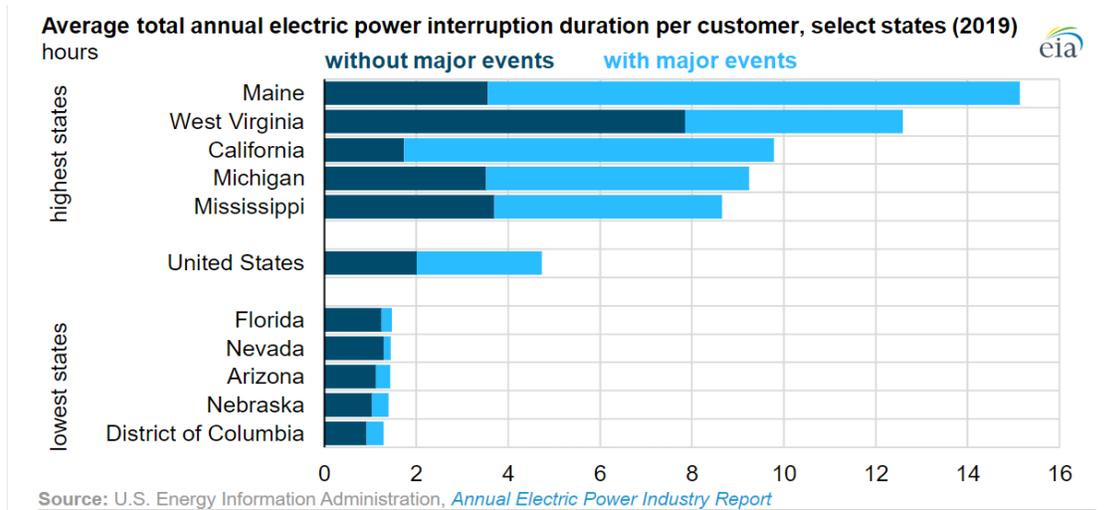
Extent: While ice storms of the magnitude of 1998 (the Great Ice Storm of 1998) and 2008 are unlikely on a yearly basis, they do have a devastating impact on people, property and the environment. Long term power outages in winter temperatures can be deadly. In the words of the State Hazard Mitigation Plan, “In the event of an extended power outage residents without an alternate heating source are vulnerable to cold temperatures, and remote populations could be without power for a (sic) upwards to (sic) several weeks.” (p.3-44).” In addition to the hazards presented by falling trees and power lines, and roadway conditions, carbon monoxide poisonings from misuse of alternative heating sources and fires started by these heat sources add to the death tolls.

Impact: Blizzards, ice storms, and nor'easters can all cause heavy winds and downed power lines and/or poles. These disrupt public safety, transportation, and residential and commercial power. For those not served by a water district, well water for food, sanitation and farm animals cannot be accessed unless there are alternate power sources available. Multi-day outages create the need for warming centers, requiring local EMA directors to order their opening. Heavy snow loads can cause roofs to collapse, endangering people and livestock.

In addition to the damage and danger to people and property, ice storms have a devastating impact on the environment. Maine is a heavily forested state, and that includes several parts of Cumberland

County. Broken limbs and downed trees leave the affected area open to insects and disease. Accumulating debris can also feed fires, should they break out.

Because of its impact, power disruptions are a major concern to local EMA Directors as shown in the 2020 THIRA. This is echoed by the participants of the public participation survey, with several commenting on long duration outages. This concern is supported by statistics from the U.S. Energy Information Administration which rates Maine as the state with the highest number of annual outages with major events, as can be seen in the graphic below. While these power outages are not technically a natural hazard in and of themselves, they are a direct result of the hazard, and so must be considered in this Risk Assessment as part of the various severe weather types.



Previous ice storm occurrences affecting Cumberland County that rose to Declaration level

Month of Occurrence	Year	County(ies)	Damage (As noted in Declaration)	Declaration
Jan 5-25 "Great Ice Storm of 98"	1998	Statewide. As in 1929, this storm extended from western New York into all of Maine.	\$47,748,466 Power outages [Loss of heat, refrigeration, sanitation services] Forestry damage	Presidential FEMA-1198-DRME
Dec 11	2008	Cumberland, Knox Lincoln, Sagadahoc Waldo, York	Maine severe winter storm, winter storms and extreme cold	Presidential FEMA-3298-EM-ME

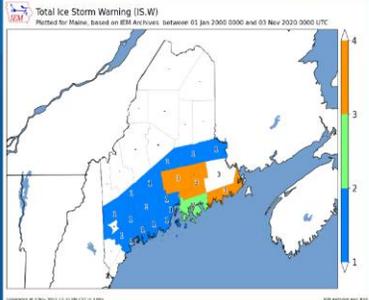
Probability of Future Events:

The NWS Cumberland County THIRA provides a look at the probability of this type of event



Ice Storms

- Ice storms like 2008 are quite rare events although freezing rain is very common. Large ice storms are typically once every 20 year events.



Likelihood Scale	
1	Unlikely
2	Somewhat Likely
3	Likely
4	Highly Likely
5	Certain



According to the State Mitigation Plan, “Climate models suggest that Maine is likely to get more ice storms in the future because of warmer temperatures.

Type: Nor'easters

A nor'easter is a storm that forms along the East Coast of North America. Nor'easters are named after the direction from which the strongest winds typically blow over the northeast states, including New England and the Mid-Atlantic states. The storms can bring wind, snow, rain and flooding to these regions...nor'easters thrive and pick up strength from cold air in the atmosphere, while hurricanes thrive on warm air. Nor'easters can happen any time of year, but they are most common between September and April, and are typically most severe in the winter months. [SciJinks: Nor'easter](#)

Nor'easters are a hybrid storm, with elements of blizzards and hurricanes. They nearly always bring precipitation in the form of heavy rain or snow, as well as winds of gale force, rough seas, and, occasionally, coastal flooding to the affected regions. [weather.gov](#)

Location: Depending on the track and the intensity of the storm, all areas of the County may be affected, with the most severe effects usually being along the coastal communities with coastal damages such as erosion and flooding.

While nor'easters typically occur during the winter months, they can happen at any time of the year. One notable storm was the “Snowtober” Storm of October 2011. A powerful nor'easter battered the East Coast and produced an unusually early snowfall across the Northeast. It left Maine with 20” of snow and 160,000 people without power due to the heavy weight of snow on the trees which had not yet shed their leaves.

Other notable nor'easters include the January 6, 2017 storm with 69 mph winds in Portland which included significant coastal flooding, and the October 31, 2017 storm which, because of the high cost of damages, (\$1,571,980 for Cumberland County) rose to the level of A FEMA declaration (FEMA DR-4354-ME). During this storm, power outages in Central Maine Power's area of responsibility were more than double those from the destructive 1998 New England ice storm, previously the highest number of outages in the utility's 118-year history. [weather.com](#)



Yarmouth Pratt's Brook Park, used by permission



Portland, used by permission

Extent: As in most storms, the storm track dictates which parts of the County are most impacted, but all areas are susceptible and are all affected each year.

Impact: Depending on the time of year a nor'easter strikes the area, damages can range from downed trees resulting in long term power outages, flooding, and transportation difficulties, to feet of snow and dangers similar to those listed in the Blizzards and heavy snowstorms section above. Many of the storms listed in the Plan were nor'easters and have been noted as such.

Previous Occurrences (not listed in blizzards and heavy snow):

Month of Occurrence	Year	Declaration
October 31	2017	FEMA DR-4354-ME
January 3-4	2018	N/A
October 29	2018	N/A
December 6	2020	N/A

Previous Occurrences of Blizzards, Heavy Snow, and Nor'easters

Probability of future occurrences: As included in the NWS slide on blizzards, it is certain there will be nor'easters on a yearly basis in Cumberland County.

Vulnerability to Severe Winter Storms

All of Cumberland County is vulnerable to severe winter storms. No studies have been found to determine the effects on critical infrastructure, but local historical knowledge corroborates the major vulnerability is to the electrical infrastructure and transportation. As a downstream effect, the length of time of power outages has a large impact, especially for those who cannot afford a secondary source of power. Lack of heat, frozen pipes, and food losses are difficult to statistically analyze since many families do not report them, but they can be devastating to the more vulnerable communities.

Severe summer weather is another major concern for both the public and emergency managers. For the purposes of this Plan, severe summer weather includes hurricanes and tropical storms, severe

thunderstorms, windstorms, tornadoes, drought, and excessive heat. Note that tropical storms and hurricanes are included in this section even though they are considered separately in the County THIRA, as they are a warmer weather phenomenon.

Type: Hurricanes and tropical storms

“A hurricane is a type of storm called a tropical cyclone, which forms over tropical or subtropical waters... Hurricanes originate in the Atlantic basin, which includes the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico...” [NOAA](#)

Storm surge is historically the leading cause of hurricane-related deaths in the United States.

[Ready.gov](#)

Hurricanes require four ingredients to develop

- A pre-existing weather disturbance: A hurricane often starts out as a tropical wave.
- Warm water: Water at least 26.5 degrees Celsius over a depth of 50 meters powers the storm.
- Thunderstorm activity: Thunderstorms turn ocean heat into hurricane fuel.
- Low wind shear: A large difference in wind speed and direction around or near the storm can weaken it. [NOAA](#)

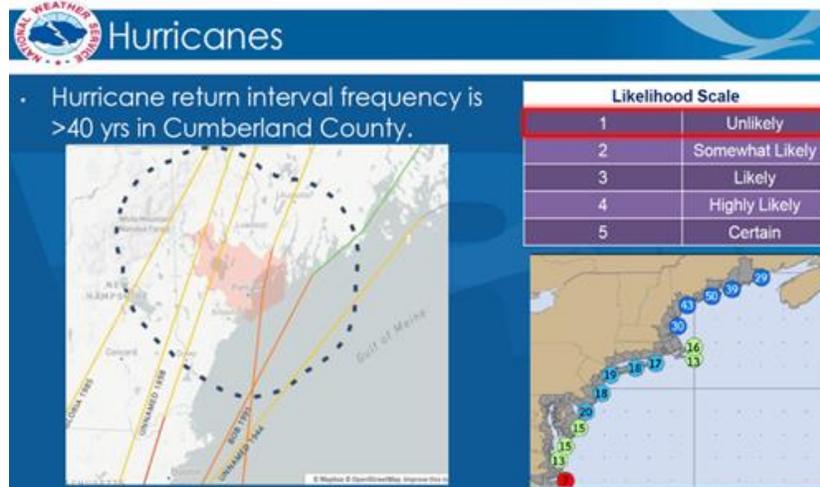
Hurricane season officially runs from June 1 through November 30th with a peak in Maine of around September 10th. Because of the cooler waters of the Gulf of Maine, hurricanes “typically weaken before reaching Maine, but it is possible for strong storms to reach the state. Hurricane forecasts will have uncertainty due to variables of the hazard which include forward tract (sic) and approach, storm speed, wind speed, storm size, and precipitation. (State Hazard Mitigation Plan P3-51)

Hurricane force winds are defined by the Saffir-Simpson Hurricane Wind Scale, which the State Hazard Mitigation Plan uses.

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

[NOAA](#)

Location: Hurricanes and tropical storms can strike any part or all of the County with varying degrees of impact depending on the storm track. Again, referring to the NWS THIRA, historical storm tracks cover every part of Cumberland County.xcdnjh



Extent: If the storm takes a more coastal track, winds, and storm surge are the most likely impacts. Storm surges create damaging erosion on our beaches and marshes and can drive water far inland. Power outages, and transportation problems are created. The above shown Saffir-Simpson scale explains damages related to storm strength.

Impact: CCEMA enlisted the services of The Northeast States Energy Consortium for a HAZUS report for Cumberland County, using a Category 3 hurricane as worst case scenario. It must be noted that no recorded hurricane in Maine has reached this level, but with a rapidly warming climate, it is a possibility. The report, in Appendix 3 Section 4, provides a detailed impact analysis.

Tropical storms are more likely to reach Maine. Their impacts to structures are shown in the chart below. Additionally, downed trees and power lines create the same impacts as other types of storms.

The National Weather Service defines tropical storms this way:

- Tropical Depression**
 A tropical depression is a tropical cyclone that has maximum sustained surface winds (one-minute average) of 38 mph (33 knots) or less.
- Tropical Storm**
 A tropical storm is a tropical cyclone that has maximum sustained surface winds ranging from 39-73 mph (34 to 63 knots). weather.gov

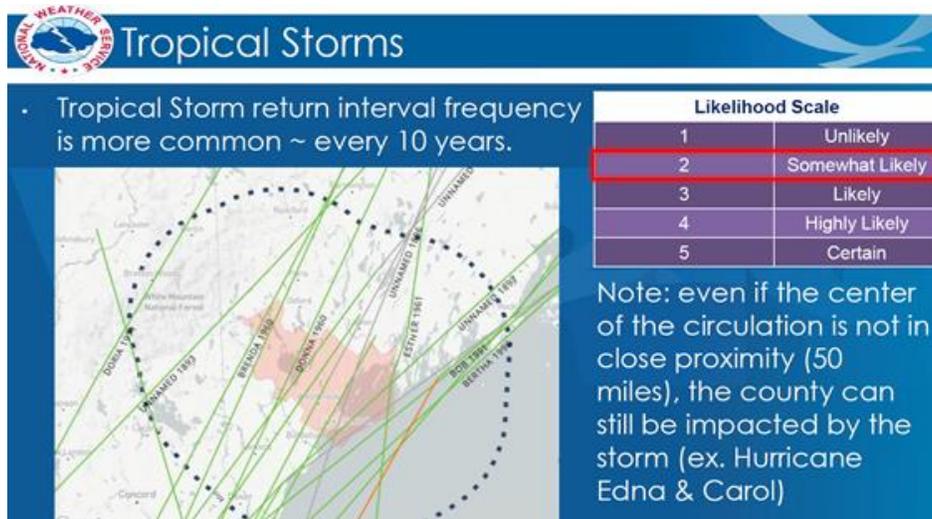
Category	Definition	Effects
Tropical Depression	Winds: up to 38 mph	Minor damage will occur to many mobile homes. A few homes may receive mostly minor damage to roof shingles and siding.
Tropical Storm (TS)	Winds: 39-73 mph	Most mobile homes will experience moderate to substantial damage. * Houses of poor to average construction will have damage to shingles, siding and gutters. * Some windows will be blown out.

weather.gov

Previous Occurrences: One must look back to 1963 to find the last hurricane to strike Maine, which interestingly, caused snow to fall in Maine along with high winds. The last tropical storm to reach Cumberland County was Floyd in 1999. The following chart begins with 1954 and is drawn from the State Mitigation Plan.

Month	Year	Category	County(ies)	Est. Damage	Declaration
August 31 Carol	1954	1	Cumberland, Knox, Lincoln, Sagadahoc, Waldo, York	\$5,000,000 3 Deaths Power outages Downed trees	SBA
Sept 11 Edna	1954	1	Statewide (flooding)	\$7,000,000 8 Deaths Power outages	Presidential #24
Sept 12 Donna	1960	TS	Cumberland	\$250,000 Power outages	
Oct.6 Daisy	1960	TS	Cumberland (flooding)	2 Deaths Power outages	
Oct. 29 Ginny	1963	1	Statewide		
Sept 17 Gloria	1985	TS	Androscoggin, Cumberland, Franklin, Kennebec, Somerset, York	3 Injuries Downed trees Power failures (up to 14 days, 250,000 people affected)	
Sept 10 Bob	1991	TS	Androscoggin, Cumberland, Franklin, Kennebec, Sagadahoc, York	\$5,523,665 3 Deaths Power outages	Presidential FEMA-915-DR-ME

Probability of Future Occurrences: Tropical cyclones (hurricanes and tropical storms) do occur in Maine, but not at frequent intervals. In fact, the National Weather Service Cumberland County THIRA gives a return frequency for hurricanes at >40 years, and for tropical storms approximately every ten years.



Type: Severe Thunderstorms

A thunderstorm requires moisture, instability and lifting for development. For a severe thunderstorm, wind shear is needed. All of these elements can be present in Cumberland County, usually during the months of May through August. For a more complete explanation of the mechanics of thunderstorm

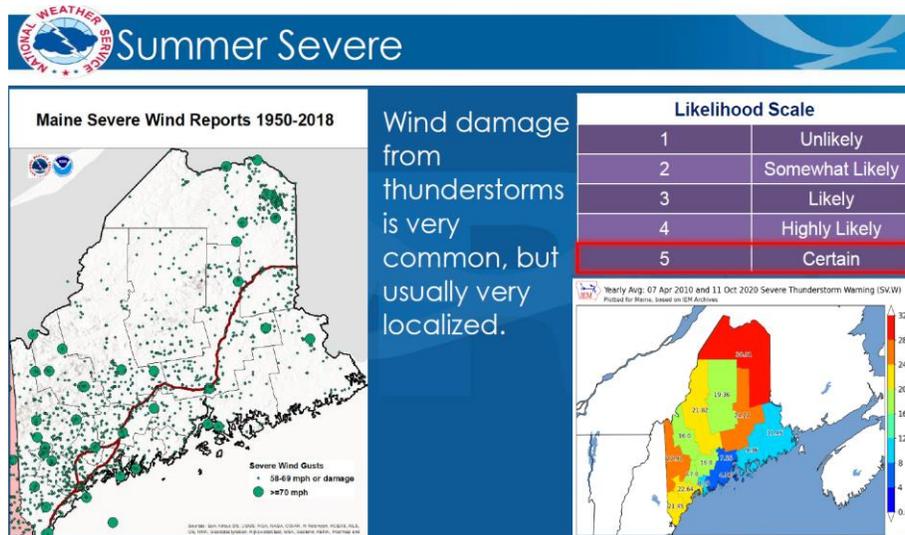
development, see weather.com. Any thunderstorm can become a “severe” storm, which is defined by the NWS as “a **thunderstorm** that produces one-inch hail or larger in diameter and/or winds equal or exceed 58 miles an hour. weather.gov

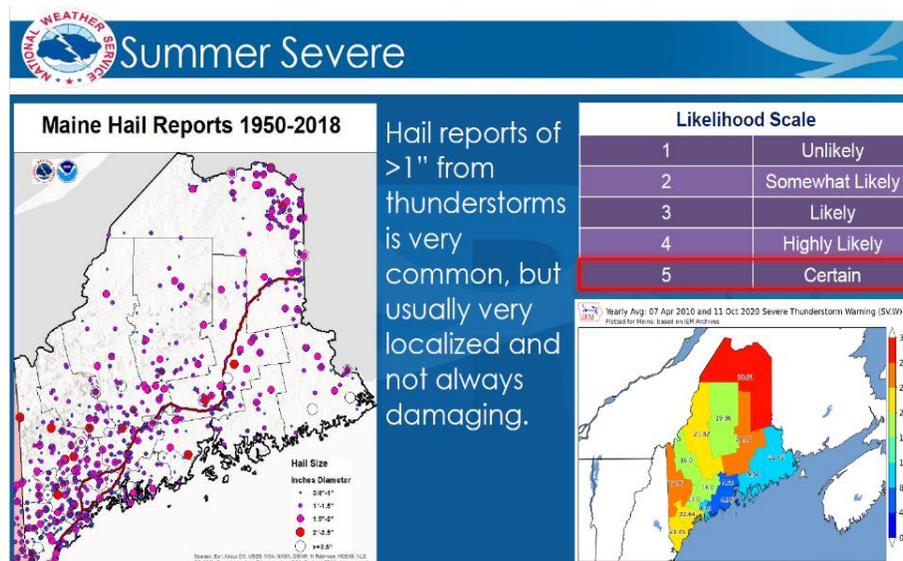
Location: All areas of Cumberland County are susceptible to severe thunderstorms, although they may be suppressed along the coastal areas due to the cooler onshore breezes from the Atlantic Ocean.

Extent: A severe thunderstorm may produce high winds which can knock down trees, causing power outages. Heavy rains can cause flash flooding. The hail sometimes associated with a severe storm can damage crops. Lightning strikes can cause urban or wildfires. These are all localized events, and since storms are quick-moving, the impact is usually transitory.

Previous occurrences: The Gray office of the National Weather Service indicated in its annual Climatological Report for 2020 that storms occurred on 20 days in its coverage area. The average is about 15.9 days per year. [Climatological Report \(Annual\) NWS Portland](#). Since the storms are of such frequency, and damages, if any, are localized, there are no easily available lists of occurrences.

Probability of Future Occurrences





As seen above, the NWS indicates that there is certainty that severe thunderstorms, with wind and/or hail will occur in Cumberland County in any year.

Type: *Windstorms*

Of rising concern among both the emergency management community and the public is the recent increase in windstorms that have had long-lasting effects on the area.

According to the Royal Meteorological Society, in an article posted on October 4, 2020, “New England has seen a number of mid-autumn (October–November) windstorms—high-wind events associated with extratropical cyclones—in recent years that have produced extensive infrastructure damage, raising concerns that these events may become more common in a changing climate. Storms developing at this time of year are unique in that they can have dominant cold-season characteristics while also being fueled by warm-season moisture sources (such as the remnants of tropical cyclones) or the result of an extratropical transition.”

These storms tend to produce winds in excess of 60 mph, and are capable of doing significant damage to infrastructure, homes, and the environment.

Location: All areas of the County are susceptible to windstorms, with the coastal and central interior section communities bearing a slightly higher number of storms.

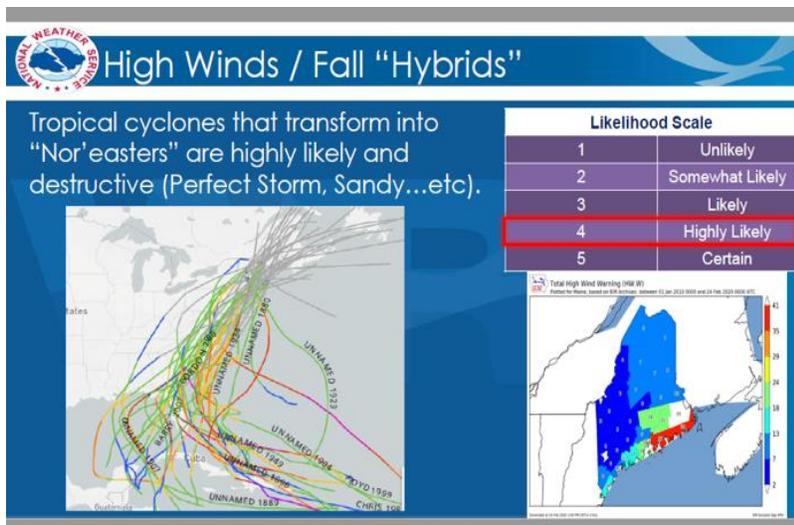
Extent: There are several ways of measuring the extent of a windstorm, but on a local level, they are measured using the number of power outages and roads blocked by downed trees. While there is no single site that lists windstorms, a brief scan of news articles related to power outages caused by the storms gives an indication of their impact. Some of the storms are listed in the table below. Note that the outages are a total of Central Maine Power outages and are not limited to Cumberland County, but they express the magnitude of the impact caused by the storm. In several instances, the outages lasted for a week or more. Property damages, transportation and public safety access along with flooding are the typical impacts on the County. The damage also includes damages to Cumberland County’s forests. According to a study published on October 4, 2020 by RMets, and funded in part by the University of Maine, states, “Autumn wind storms can potentially result in greater tree damage than those in other

seasons, as the presence of foliage increases drag and wind stress on a tree and thus the risk of tree damage or uprooting from high winds [Historical Incidence of Autumn Wind Storms](#)

Previous Occurrences: (recent events)

Date	Number of Outages	Reported Wind Speeds
Oct 31-Nov 1, 2017	385,000+	80+ mph
Nov 3, 2018	34,593	60+ mph
Oct 17, 2019	168,000	60+mph
Nov.16, 2020	20,000	60+ mph

Probability of Future Occurrences: According to the National Weather Service, these events are highly likely to continue



There is also concern among climate scientists that with well documented warming trends in the Atlantic, “projected increases in coastal storm track density over the eastern United States could result in more frequent nor'easters, which are associated with high winds as well as high storm surges. (from the RMets study)

Type: Tornadoes

According to the Maine Emergency Management Agency, “Usually, prior to the development of a tornado, a pre-tornadic thunderstorm develops a circulation, that is, it starts rotating (a meso-cyclone). As this rotation becomes stronger, the chance that a tornado may develop also increases. [Definition of Tornado](#)

Tornado strength and damage is rated by the Enhanced Fujita Scale which became operational on February 1, 2017.

Enhanced F wind scale

EF SCALE	
EF Rating	3 Second Gust (mph)
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

[ef scale](#)

The degree of damage is then described on a scale of 1 to 10. There are 28 Damage indicators depending on the type of construction. The chart below shows the residential single family home rating.

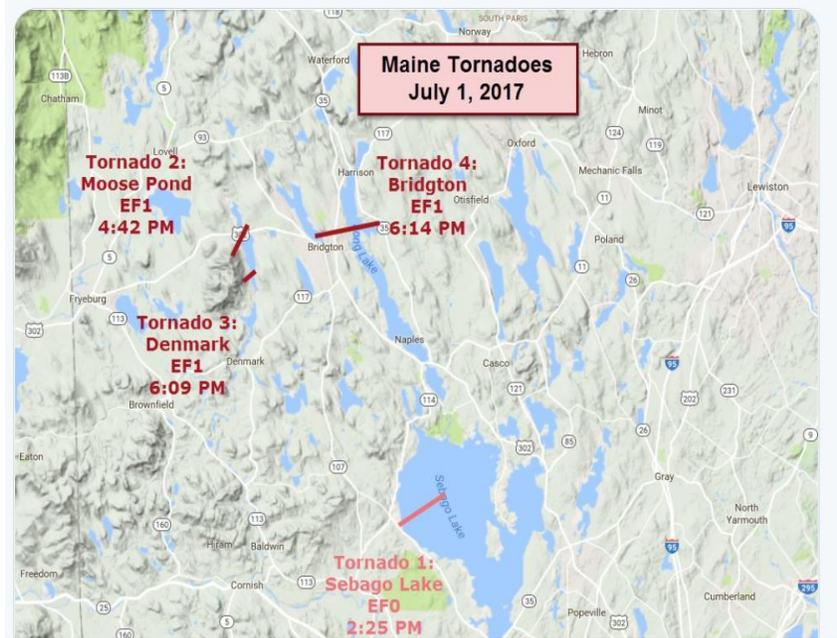
[noaa.gov ef damages](#)

DOD*	Damage Description	EXP	LB	UB
1	Threshold of visible damage	65	53	80
2	Loss of roof covering material (<20%), gutters and/or awning; loss of vinyl or metal siding	79	63	97
3	Broken glass in doors and windows	96	79	114
4	Uplift of roof deck and loss of significant roof covering material (>20%); collapse of chimney; garage doors collapse inward; failure of porch or carport	97	81	116
5	Entire house shifts off foundation	121	103	141
6	Large sections of roof structure removed; most walls remain standing	122	104	142
7	Exterior walls collapse	132	113	153
8	Most walls collapsed, except small interior rooms	152	127	178
9	All walls	170	142	198
10	Destruction of engineered and/or well-constructed residence; slab swept clean	200	165	220

*DOD = Degree of Destruction

Each DOD in each category is given an expected estimate of wind speed (EXP), a lower bound of wind speed (LB) and an upper bound of wind speed (UB).

Location: According to the Maine Emergency Management Agency website, “Maine has on average 2 tornadoes every year. The tornadoes in recent history in Maine have formed during severe summer storms within the southwestern and central sections of the State.” [MEMA Tornado](#) While all of the county is susceptible to tornadoes, the more recent ones have occurred in the western areas. On one memorable afternoon in July 2017, several tornadoes struck the Lakes Region of the County. Sebago, Harrison and Bridgton bore the brunt of the storms.



NWS Gray



NWS tweeted: Jul 1, 2017 “We issued 7 Tornado Warnings today, the most we’ve ever issued in a single day or even a whole year until now!”

Extent: All of the County is susceptible to tornadoes, but as can be seen in the chart below and the following NWS slide, many of the tornadoes occur in the interior sections.

Previous Occurrences in Cumberland County, as compiled by the National Weather Service from 1995 to the present edited to show only those affecting Cumberland County):

Date	Location	Strength
August 8, 2004	Sebago Lake	EF 0
November 24, 2005	Brunswick	EF 0
July 21, 2010	Buxton to Gorham	EF 1

July 27, 2014	Sebago Lake (waterspout)	EF 0
July 1, 2017	Bridgton	EF 1
July 1, 2017	Bridgton	EF 1

[Severe Weather Awareness](#)

Probability of Future Occurrences: Again, relying on the NWS Gray THIRA, it is somewhat likely that Cumberland County will sustain tornadoes in the future.

Summer Severe

Maine Tornado Reports 1950-2018

- Verified Tornadoes in the county are unlikely but they do occur. More common in lakes region of the county.

Likelihood Scale	
1	Unlikely
2	Somewhat Likely
3	Likely
4	Highly Likely
5	Certain

Water spout forms over Barber Pond in Sebago, Maine

Type: Drought

A drought is defined as "a period of abnormally dry weather sufficiently prolonged for the lack of water to cause serious hydrologic imbalance in the affected area." -Glossary of Meteorology (1959).

In easier to understand terms, a drought is a period of unusually persistent dry weather that persists long enough to cause serious problems such as crop damage and/or water supply shortages. The severity of the drought depends upon the degree of moisture deficiency, the duration, and the size of the affected area.

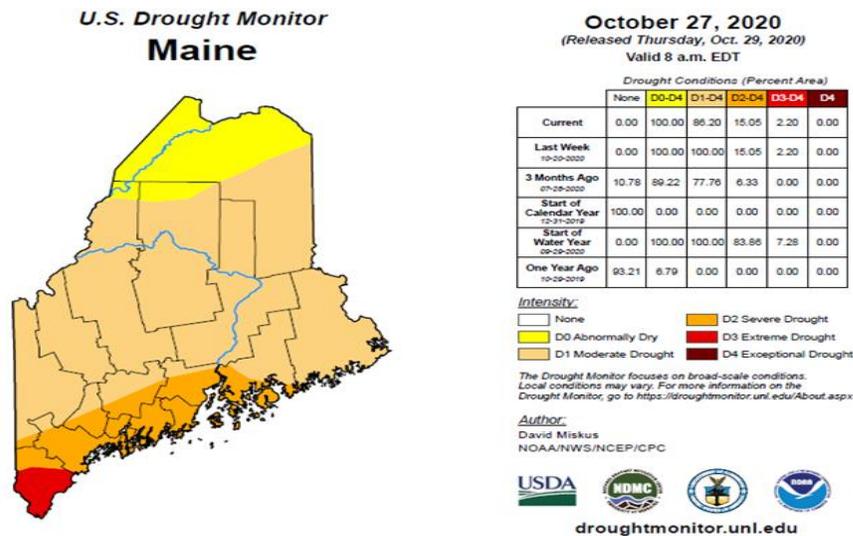
There are actually four different ways that drought can be defined.

- Meteorological-a measure of departure of precipitation from normal. Due to climatic differences, what might be considered a drought in one location of the country may not be a drought in another location.
- Agricultural-refers to a situation where the amount of moisture in the soil no longer meets the needs of a particular crop.
- Hydrological-occurs when surface and subsurface water supplies are below normal.
- Socioeconomic-refers to the situation that occurs when physical water shortages begin to affect people." [Drought definition](#).

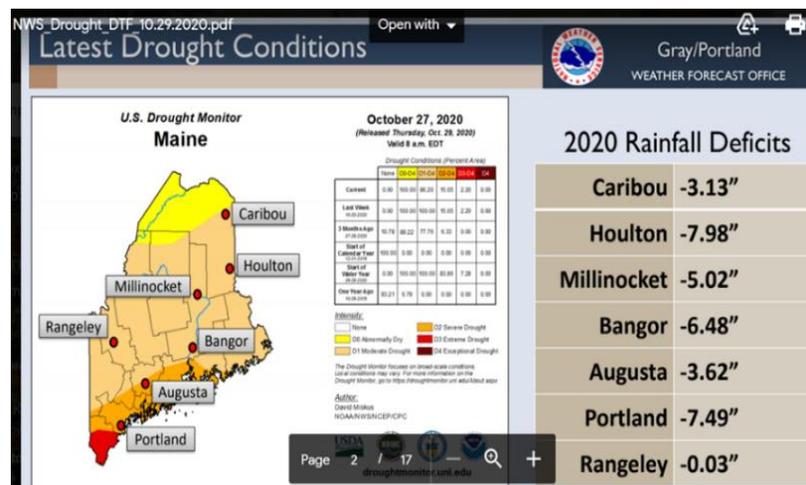
Maine initiates its Drought Task Force, consisting of several State agencies and partners, when it becomes apparent that the State is beginning to experience drought conditions. This Task Force, which CCEMA participates in, meets every two weeks for the duration of the drought and exchanges information on meteorological, hydrological, and agricultural conditions along with water utility actions

and any other pertinent data. Reports on drought conditions in Maine and links to other drought monitoring resources are available at the Maine Drought Task Force Website ([Drought Task Force](#)).

Location: All of Cumberland County is susceptible to drought. A map of the 2020 drought (below) corroborates this.



During 2020, much of Cumberland County was in a D3 drought for most of the late summer and fall. This was a result of extreme (for Maine) rainfall deficits, as is shown in the October 29, 2020 NWS presentation to the Maine Drought Task Force



NWS Gray Maine presentation to Drought Task Force October 29, 2020

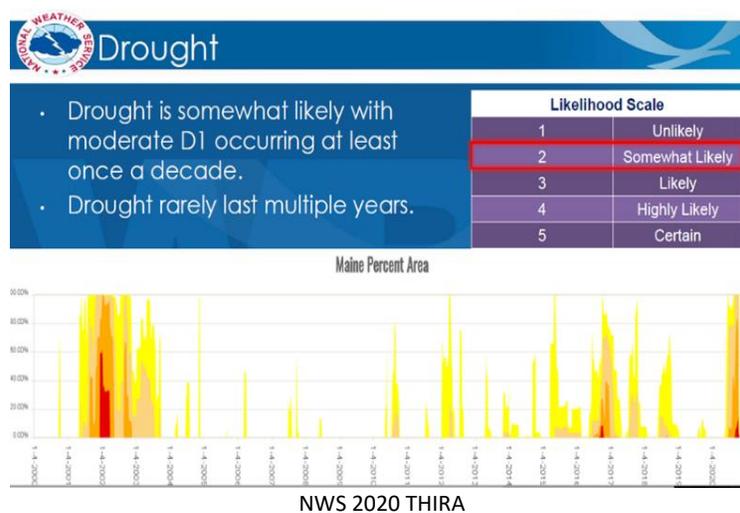
Impact: The effects of both the 2017 and 2020 droughts were primarily agricultural. The Farm Services Administration, in its announcement of an emergency declaration for 2020 ([Emergency Declaration](#)), said “Agriculture Secretary Sonny Perdue designated two Maine counties as primary natural disaster areas. Producers in Cumberland and York counties who suffered losses caused by drought and above-normal temperatures that has occurred since May 1, 2020, may be eligible for U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) emergency loans. FSA Farm Programs automatically trigger once the county has been at D2 drought status for 8 consecutive weeks or immediately upon hitting D3 status for

any length of time, as reported weekly by the U.S. Drought Monitor. [Secretarial Disaster Designation Process](#) Aroostook, Penobscot, Cumberland and York Counties have all reached the D3 level and contiguous counties will include Washington, Hancock, Waldo, Somerset, Piscataquis, Oxford, Androscoggin, and Sagadahoc.

Maine uses a dry well survey during times of drought. While reports for Cumberland County were minimal (13 discrete addresses), this may reflect a large number of homeowners who had experienced the 2017 drought and as a result either drilled deeper wells or changed from a dug well to a drilled well.

Additionally, environmental impacts, which are not easily measured, include stress on forests, rivers and wildlife.

Previous Occurrences: In the past 20 years, the most notable drought was the 2002-2003 event, which was chronicled in an article by the New York Times, “Drought Leaves Maine Stoic but Struggling.” [New York Times article](#). Other notable events occurred in 2017 and 2020.



Probability for Future Occurrences: Even as Maine may experience increasing precipitation, indications are that it will occur in the form of more intense storms with long periods between. According to Maine’s Climate Future, “As the climate warms, future droughts and periods of limited moisture are likely to worsen with higher temperatures favoring increased drying. There is considerable uncertainty whether drought will become more frequent in the future, presenting further challenges to decision-making. More resources for addressing drought are becoming available for the public, such as the National Integrated Drought Information System (NIDIS 2019).” [Maine's Climate Future](#)

Flooding

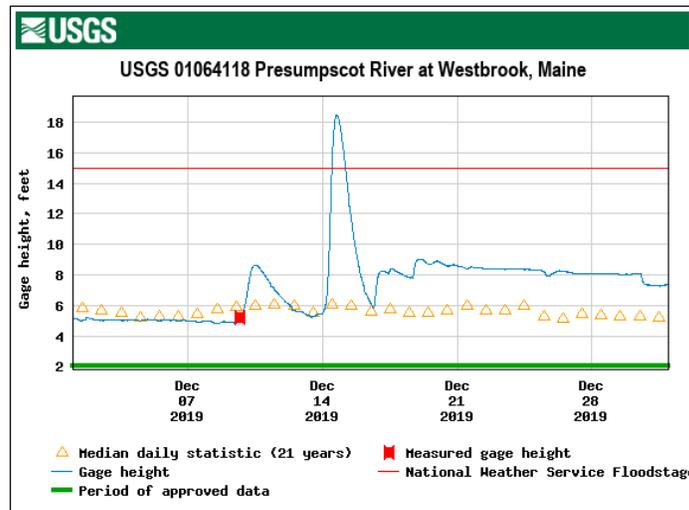
FEMA’s definition of a flood, especially as it pertains to the National Flood Insurance Program (NFIP), is as follows: A general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land area or of 2 or more properties (at least 1 of which is the policyholder’s property) from:

- Overflow of inland or tidal waters;
- Unusual and rapid accumulation or runoff of surface waters from any source; or
- Mudflow; or

- Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above. [NFIP definitions](#)

According to the State Hazard Mitigation Plan and local historical knowledge, “The nature of Maine’s geography, geology and hydrology is such that flooding is usually fast rising but of short duration.” The two types of flooding that will be profiled in this section include riverine and coastal flooding (including coastal erosion).

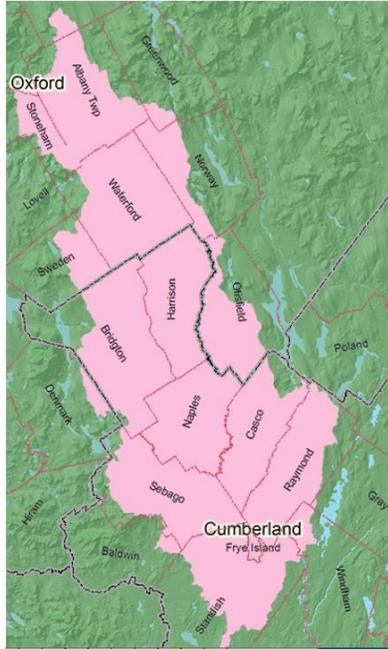
The short duration of most precipitation events is made evident by this graph of the result of an almost 3.5” rainstorm on December 14, 2019, the latest flood stage level on the Presumpscot River.



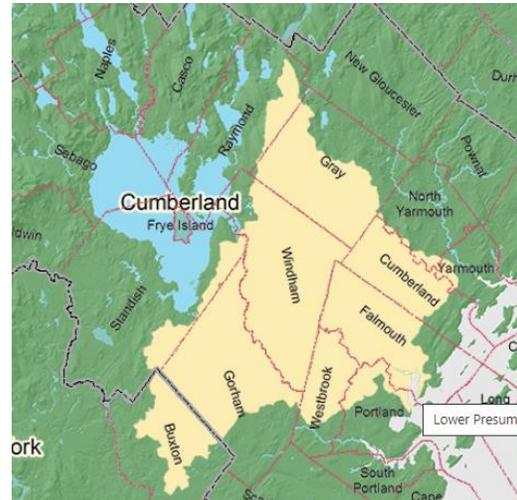
Type: Riverine Flooding:

Riverine flooding is defined as “When surface water runoff introduced into streams and rivers exceeds the capacity of the natural or constructed channels to accommodate the flow, water overflows the stream banks, spilling out into adjacent low lying areas.” [Types of Floods](#)

Location: There are many small rivers and streams that run throughout the County with the potential for minor flooding during rapid snowmelt or excessive rain events. For many of them, however, the results are limited in area and minimal in damages. The two rivers with the most potential for causing flood damages are the Presumpscot River and the Royal River. These two watersheds cover almost 88% of the County, so are profiled here.



Upper Presumpscot Watershed

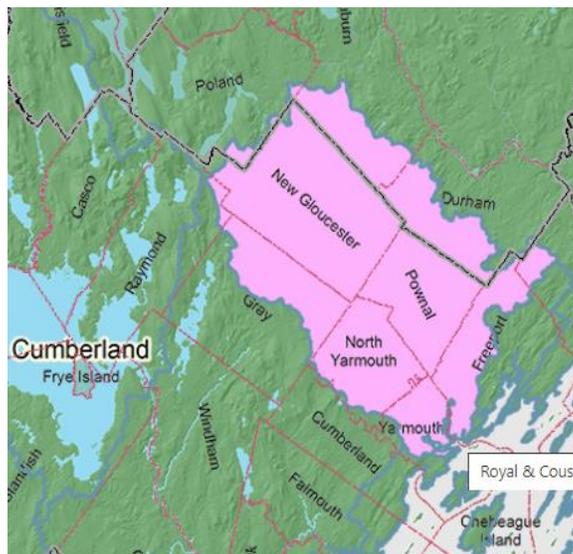


Lower Presumpscot Watershed

[Watershed maps](#)

The Presumpscot River is the main outlet for Sebago Lake and empties 25.8 miles later into the Gulf of Maine. “Windham, Gorham, Westbrook, Cumberland, Falmouth, and Portland represent primary municipalities in the Presumpscot River watershed, and are characterized by multiple land uses. Urban areas include residential and commercial dwellings, commercial businesses, light industry, and water and wastewater treatment plants.” [DEP Report](#) River flow is highly regulated by the Eel Weir Dam at Sebago Lake.

The Royal River is the second largest source of freshwater to Casco Bay, and flows nearly 26 miles from its source at the outlet of Sabbathday Lake in New Gloucester to its mouth in Casco Bay in Yarmouth.



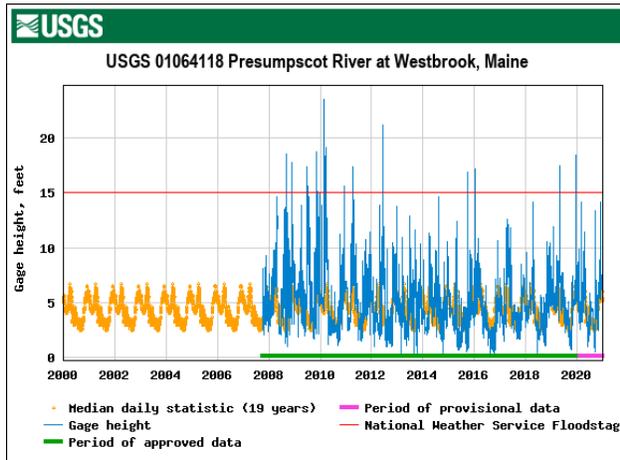
The Royal River watershed includes approximately 141 square miles of land in Auburn, Durham (in Androscoggin County), Gray, New Gloucester, North Yarmouth, Pownal and Yarmouth.

Table 54. Presumpscot River, Tributaries from Upstream to Downstream and Drainage Areas

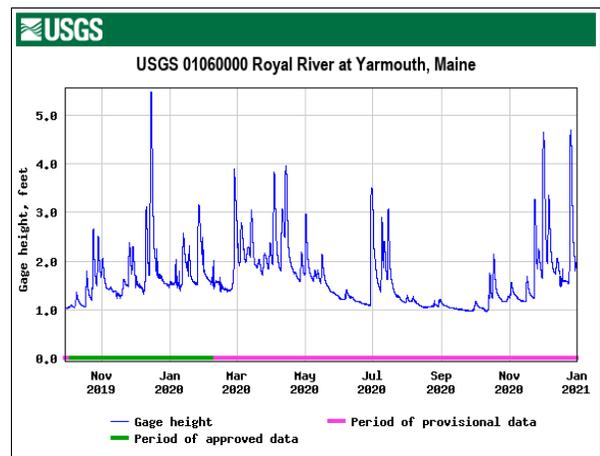
Tributary	Drainage Area (square miles)
Sebago Lake	440
Royal River	140
Presumpscot River	210
Scarborough River	50
Fore River	50
Casco Bay Coastal Drainages	170
Total	1,070

[Maine River Basin Report](#)

Extent: Statistical data on riverine flooding in Cumberland County is primarily from the Presumpscot River, which has the longest history of measurement data in Cumberland County, and was, for many years, the only gauged river until the Royal River gauges were reestablished in September 2019. SAPPI North America regulated the river flow and the levels of Sebago Lake. While this helps to moderate the flow of water, the many tributaries contribute to the rise in water levels at the lower end of the river, occasionally creating flood conditions.



Presumpscot River 2000-2020



Royal River 2019-2020

Impact:

Many floods cause roadway erosion or overtopping which diminishes rapidly. There are some exceptions, however. The 1996 Presumpscot River flood created problems for roadways such as the intersection of Route 302 and Bridge Street in Westbrook, where the water rose to cover the road and surrounding area. On other roads in Westbrook, bridges were washed away, leaving the city a series of islands. (personal reminiscence, Ron Jones, past Westbrook EMA Director)



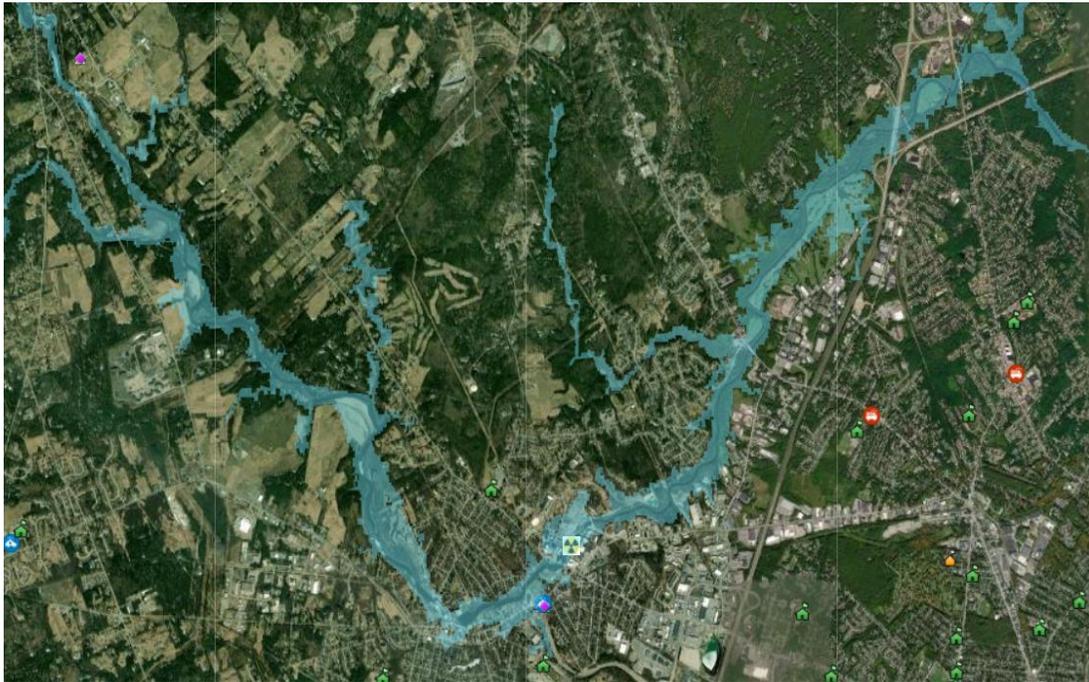
Figure 4. Aerial view of the Presumpscot River at Route 302 in Westbrook, Maine (site 11) on October 22, 1996 (Photograph by John Patriquin / The Portland Newspapers).



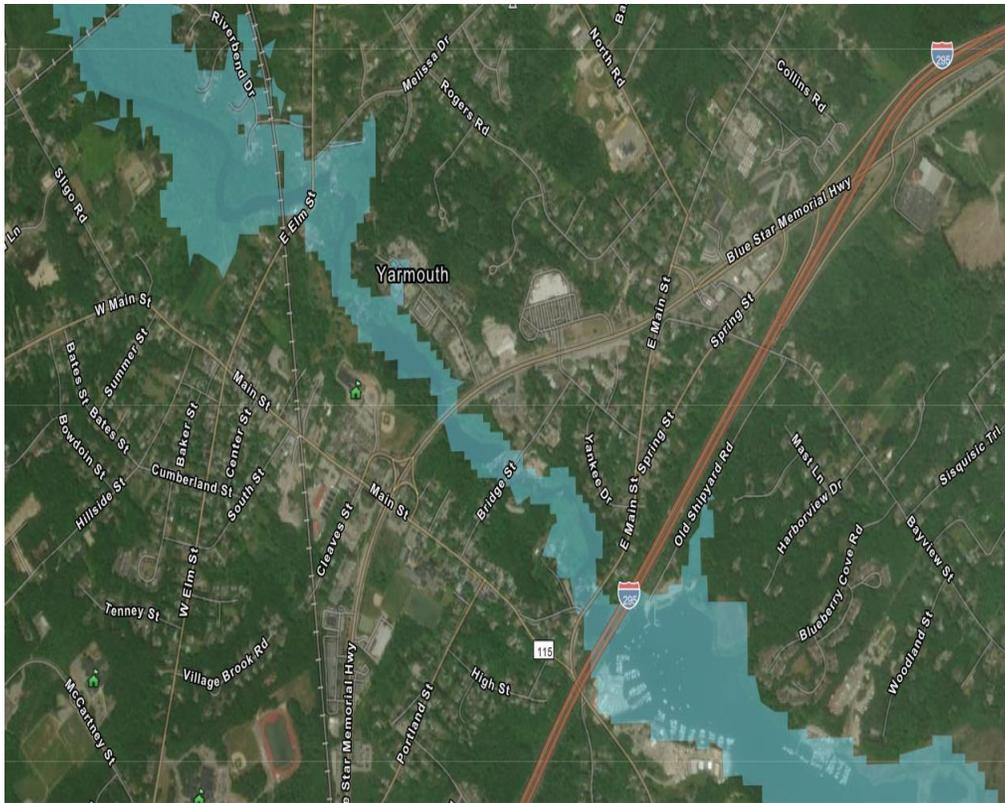
Figure 5. Presumpscot River at Route 302 in Westbrook, Maine (site 11) on October 22, 1996. Note the high-water mark on Route 302 and the debris on the upstream guardrail of the bridge (Photograph by David A. Rodgers / The Portland Newspapers).

[Flood of 1996](#)

The NESEC projections of the 500-year flood show the heavily populated area that could be submerged.



The Royal River area, on the other hand, is far less populated, but with the Town of Yarmouth being at highest risk. According to the NESEC map, a section of Interstate 295 is vulnerable to flooding.



Previous Occurrences: [NWS](#) defines minor, moderate and major flood stages indicating the degree to which flood events overflow the natural banks of the river and begin to cause flood damage in the local area. Flood stage on the Presumpscot is 15', with major flood stage of 27'. The flood of record remains 34.1' on October 22, 1996. The NWS Cumberland County THIRA shows previous incidents, flood stages, and the **probability of future events**

Flooding

- **River Flooding**
 - Presumpscot River & Royal River are 2 primary rivers in county
 - Presumpscot River has historical flood frequency data, Royal River is now gauged again
- In general minor river flooding occurs every 3 years. Moderate or higher is generally once a decade event.

Recent Crests

- (1) 17.17 ft on 01/11/2016
- (2) 16.95 ft on 09/30/2015
- (3) 21.25 ft on 06/03/2012
- (4) 15.70 ft on 12/13/2010
- (5) 15.57 ft on 03/24/2010
- (6) 23.55 ft on 02/26/2010
- (7) 18.55 ft on 09/07/2008
- (8) 25.30 ft on 04/16/2007
- (9) 15.52 ft on 04/02/2004
- (10) 20.88 ft on 10/10/1998
- (11) 15.80 ft on 06/27/1998
- (12) 17.12 ft on 06/17/1998
- (13) 19.18 ft on 06/14/1998
- (14) 34.10 ft on 10/22/1996
- (15) 15.07 ft on 12/25/1994
- (16) 16.00 ft on 04/13/1993
- (17) 16.06 ft on 04/11/1993
- (18) 25.48 ft on 08/20/1991
- (19) 17.06 ft on 04/23/1991
- (20) 22.26 ft on 05/12/1989
- (21) 20.83 ft on 04/01/1987
- (22) 19.11 ft on 01/27/1986

Likelihood Scale

1	Unlikely
2	Somewhat Likely
3	Likely
4	Highly Likely
5	Certain

Flood Categories (in feet)

Major Flood Stage:	27
Moderate Flood Stage:	23
Flood Stage:	15
Action Stage:	13

Historic Crests

- (1) 34.10 ft on 10/22/1996
- (2) 25.48 ft on 08/20/1991
- (3) 25.30 ft on 04/16/2007
- (4) 23.55 ft on 02/26/2010
- (5) 22.26 ft on 05/12/1989

Flooding

- Flash Flooding
 - Over the last decade the NWS has issued 20 Flash Flood Warnings in Cumberland County

Likelihood Scale	
1	Unlikely
2	Somewhat Likely
3	Likely
4	Highly Likely
5	Certain

Unlike river flooding, flash flooding can happen in any part of the county, is unpredictable and is typically highly localized.

Because of the lack of a gauge on the Royal River between 2004 and 2019, the only available record height (from USGS) is from March 13, 1977 with a height of 8.46’.

As a subset of river flooding, flash flooding can happen anywhere in the county. According to the State Mitigation Plan, “Heavy rains that often accompany thunderstorms can result in flash flooding or erosion. Under most circumstances, flash floods are localized and do damage in only small areas. Many of the project in the Strategy section of this Plan are in response to this type of flooding, as will be demonstrated in the problem statements in that section.

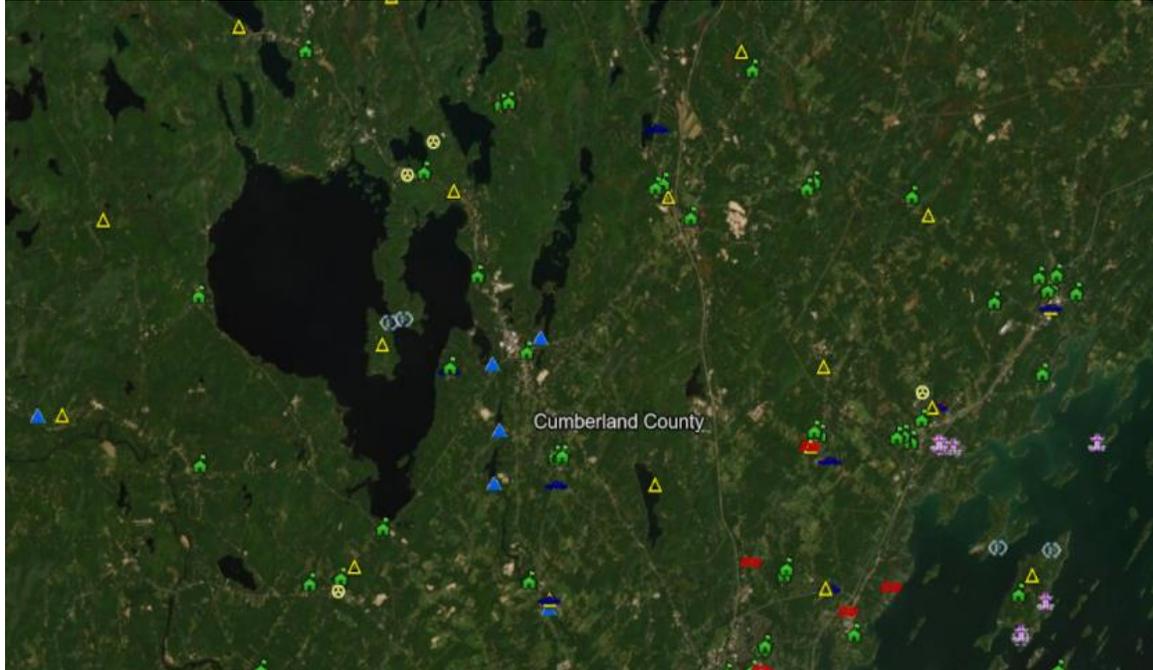
Dams

In Cumberland County, there are four high hazard dams and two significant hazard dams, as shown in the table below. The high-hazard dams are all regulated by the Federal Energy Regulatory Commission, while the significant hazard dams are regulated by MEMA. The six high and significant hazard dams all have Emergency Action Plans to mitigate the effects of failure. (One dam was reclassified from significant to low hazard as a result of road mitigation work.) The County also has 54 low hazard dams that are not included in the table. In Maine, High and Significant Hazard Dams must be inspected every six years.

A “high hazard” rating means that a dam failure/breach will put lives at risk, while a “significant hazard” rating means that dam failure will put property/natural resources at risk.

Dam Name	River	City	Owner Name	Hazard
Dundee	Presumpscot River	South Windham	S.D. Warren Company	High
North Gorham	Presumpscot River	Gorham	Brookfield Renewable Power Inc.	High
Eel Weir	Presumpscot River	South Windham	S.D. Warren Company	High
Mallison Falls	Presumpscot River	Westbrook	S.D. Warren Company	High
Little Sebago Lake	Ditch Brook	North Windham	Little Sebago Lake Association	Sig
Sanborn	Pigeon Brook	West Baldwin	Donald & Elizabeth Harrington	Sig

Panther Pond Dam and Highland Lake Dam have been downgraded to low hazard by the Maine Emergency Management Agency. Mallison Falls Dam is listed with the Federal Energy Regulatory Commission as a Significant Hazard Dam, but the State of Maine still lists it as High Hazard, so this Plan follows the Maine rating.



All High and Significant Hazard dams are marked as blue triangles.

Ice jamming is not a significant problem in Cumberland County, rarely causing any problems. The most significant icing event on the Presumpscot River was not the creation of ice jams, but rather, a 298' ice disk that made international headlines. No flooding was reported.



[British Broadcasting news](#)

16 Jan 2019

Type: Coastal Flooding and Erosion:

“Coastal flooding is usually caused by coastal storms, including tropical storms, hurricanes, and nor’easters. *Storm surge* is the amount of water, combined with the effect of normal tides that is pushed towards the shore during a storm. The height of the storm surge is driven by many variables, such as the strength and size of the storm, and the speed and direction in which the storm moves.” [FEMA Coastal Analysis](#)

Coastal flooding and erosion are serious problems along much of the nation’s coasts, although the frequency and magnitude of flooding and the severity of the erosion vary considerably. They result from storm surges and wave actions. [FEMA Types of Floods](#)

Location: The coastal communities of Scarborough, Cape Elizabeth, South Portland, Portland, Long Island, Chebeague Island Falmouth, Cumberland, Yarmouth, Freeport, Brunswick and Harpswell can be affected by coastal flooding and resulting erosion. Falmouth, Portland, South Portland, Scarborough, and Cape Elizabeth all have projects listed in the Strategy Section that address some of the issues.

Extent: The extent of coastal flooding depends on the type of shoreline, direction of the storm, tidal stage, and the degree of development. Portland and South Portland have, historically, had the most damage, typically when a storm coincides with astronomical high tides.

For example, on September 22, 2020, a coastal flood warning was issued as Hurricane Teddy remained 350 miles off the coast. The map below shows how far inland the expected flood would reach.



“In Portland, the high tide is at 3:39 p.m. For a couple hours around that time, the very high tide will lead to water rising along the wharfs, particularly on Portland Pier. In East Bayside, water will come up from the storm drains, flooding sections of Marginal Way and Somerset Street.”

[News Center Maine](#)

This type of storm often brings traffic to a near halt in the above area.



[Press Herald](#)
photo by Gabe Souza

Impact: Most frequently, roads are flooded or closed, homes may have flooded basements, local businesses are flooded, or lose business as a result of the flooded roads, and emergency vehicles are impeded. Beach erosion is of concern to area with sandy beaches. For those towns most affected by coastal flooding, mitigation projects are either underway or are projected for the near future, as can be seen in the Strategy Section of this Plan.

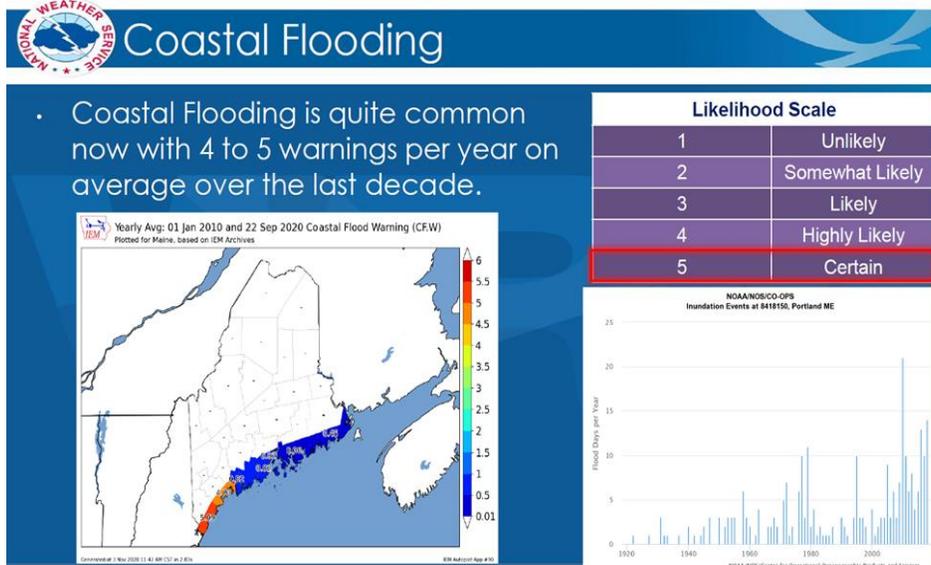
Some critical infrastructure other than roadways are also affected. Chebeague Island is working on a solution to the damages being done when storms and high tide damage the passenger ferry landing which is crucial for the 360 year round island residents and more than 1600 summer residents.



Chebeague Island Ferry landing during an astronomical high tide/storm
Photo by Beverly Johnson, used by permission

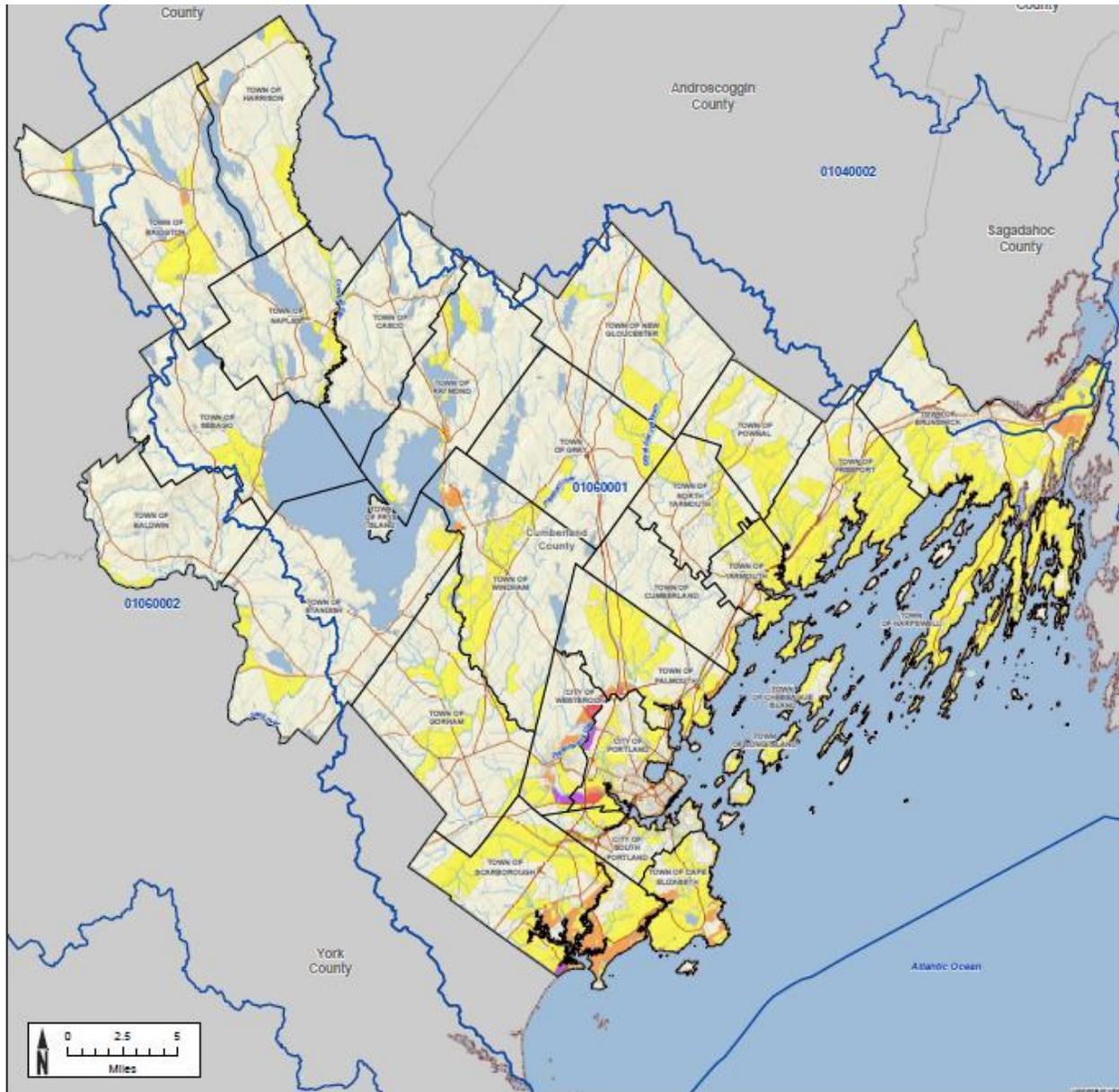
Previous Occurrences: Many of the coastal flooding incidents occur during nor'easters or tropical cyclones that never reach land but drive up the Gulf of Maine waters to overwhelm the low-lying lands. These occurrences are documented in the nor'easter section above.

Probability of Future Occurrences: The NWS THIRA provides the probability of future events.



The Climate Change Annex provides an overview of what future events might unfold.

The Cumberland County flood mapping project has not been approved, and, according to a communication from FEMA to the State NFIP Coordinator, will not “go final in 2021.” The email to the County can be found in Appendix 3 Section 4. For the purposes of this Plan, the provisional maps are used, as the currently approved maps date back to the mid-1980s. The latest (2014) County wide map is below.



MAP SYMBOLOLOGY

- | | |
|--------------------|-------------------|
| Base Data | Flood Risk |
| Major Roads | Very Low |
| State Boundary | Low |
| Rivers and Streams | Medium |
| Watershed Boundary | High |
| Corporate Limits | Very High |
| County Boundary | |

WATERSHED LOCATOR



Flood Risk Assessment Map

FRM FLOOD RISK MAP
CUMBERLAND COUNTY, ME



FEMA

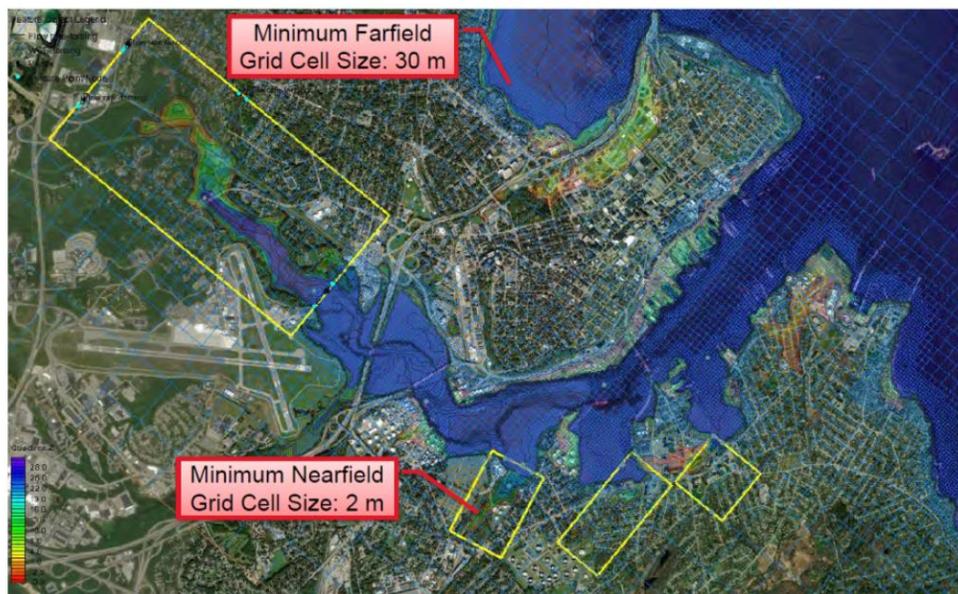
HUC-8 Code
01040002, 01060001, 01060002

For more information about the data used for this non-regulatory study, please contact the Cumberland County, Maine Flood Risk Database and Flood Risk Report.

RELEASE DATE
4/4/2014

During 2021, the U.S. Army Corps of Engineers, in collaboration with federal and state agencies and the City of Portland, began development of a dynamic model to simulate flood conditions under different sea level rise projections. The dynamic model incorporates best available topographic, bathymetric, land cover, and streamflow data to simulate coastal flood risk in Portland and surrounding areas. Unlike the Special Flood Hazard Areas monitored in current town flood ordinances, these models project future flood risk based on a combination of sea level rise and storm recurrence intervals identified by the Maine Climate Council and hydrologic analysis, respectively. Preliminary results suggest that sea level rise will contribute to substantial growth of the flood zone in coastal Portland during major rainfall or storm surge events. Implementation of mitigation actions listed in Portland' strategy section and new projects resulting from this study will be crucial for reducing long-term risk to coastal and riverine flood hazards. When complete the model will provide best available information on future flood risks.

PORTLAND/SOUTH PORTLAND MODEL UPDATE



All of Cumberland County's municipalities participate in the National Flood Insurance Program (NFIP), and two, (Portland and Cape Elizabeth) participate in the Community Rating System (CRS) at Class 8. CCEMA continues to encourage communities to become involved in the CRS.

The Repetitive Loss properties, as conveyed by the NFIP State Coordinator for the Maine Floodplain Management Program, are listed here, with further information in Appendix 3 Section 4. Jurisdictions that do not have repetitive loss properties are not listed in this table.

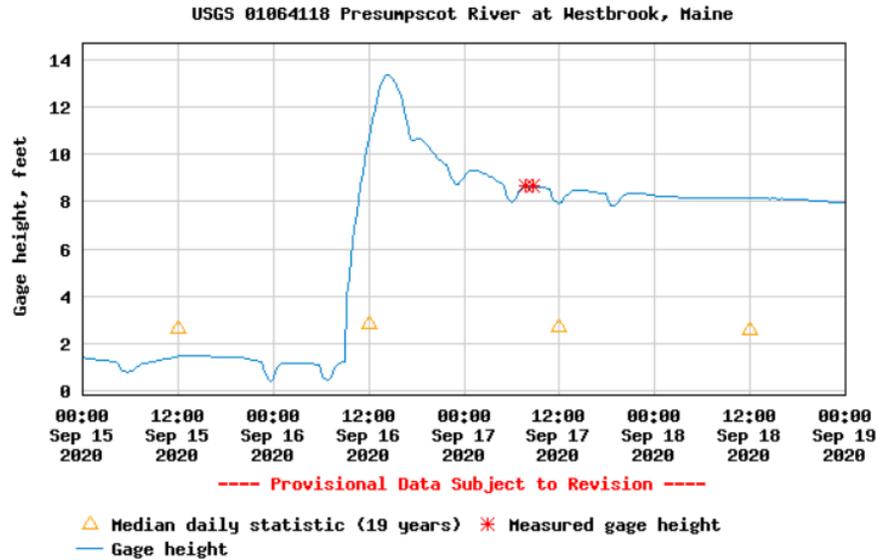
NFIP Repetitive Loss Properties					
County	Town/City	Residential Structures		Non-Residential Structures	
		# Properties	# Losses	# Properties	# Losses
Cumberland	Cape Elizabeth	1	3		
	Casco	2	4		
	Falmouth	1	2		
	Gorham	1	2		
	Gray	1	4		
	Harrison	1	2		
	Naples	1	3		
	Portland	1	3		
	Scarborough	2	5		
	South Portland	1	3		
	Westbrook			1	3
	Yarmouth			1	2

Communities maintain their NFIP insurance primarily through, but not limited to, continuing education, outreach with NFIP and building code information, inspection of new construction or remodeling before framing for Base Flood Elevations, restricting any construction in special flood hazard areas (Cape Elizabeth, Portland). Portland has preserved approximately 38% of its Special Flood Hazard Area as open space.

Landslides

According to the State Mitigation Report (2019), “Instability associated specifically with sediment known as the Presumpscot Formation has raised major concern within the highly populated coastal communities. The Presumpscot Formation is a glaciomarine mud that was deposited in areas of southern Maine that were covered by the ocean at the end of the last Ice Age. The mud can be very soft and can liquefy and flow when disturbed (earthquakes, man-made vibrations) or exposed in a slope by excavation, stream cut bank or coastal bluff erosion).”

“On September 16, 2020 at approximately 9 AM a landslide occurred behind 161 Warren Avenue depositing trees, soil, and debris into the Presumpscot River causing a near total obstruction. Local, State, and Federal Agencies have been evaluating the situation and are developing a plan for potential flood mitigation and site remediation.” From the Presumpscot Waterpower Co. Cumberland Mills, ME weekly water level report for the Presumpscot River and Sebago Lake for Monday, September 21, 2020



[USGS Presumpscot River](#)

The sharp rise in the water level indicates the impact of the river blockage on the upward side of the stream where the gauge is located. Note that as the day wore on, the river found a way through the blockage and began to flow again. The National Weather Service, which had issued a flash flood warning for the areas upstream, was able to rescind the warning by 11 PM that evening.

The landslide moved about three acres of land, and damaged some commercial properties. This incident resulted in a BRIC application for a study on methods to reduce the possibility of a repetition, which is explained in the Strategy Section of this Plan.



photo, Portland Press Herald

Excellent drone footage of the damage can be found at [Maine Public Radio](#).

In 1868, a larger landslide of about 38 acres occurred resulting in a complete blockage of the river that the local paper mill workers had to dig through to clear the channel.

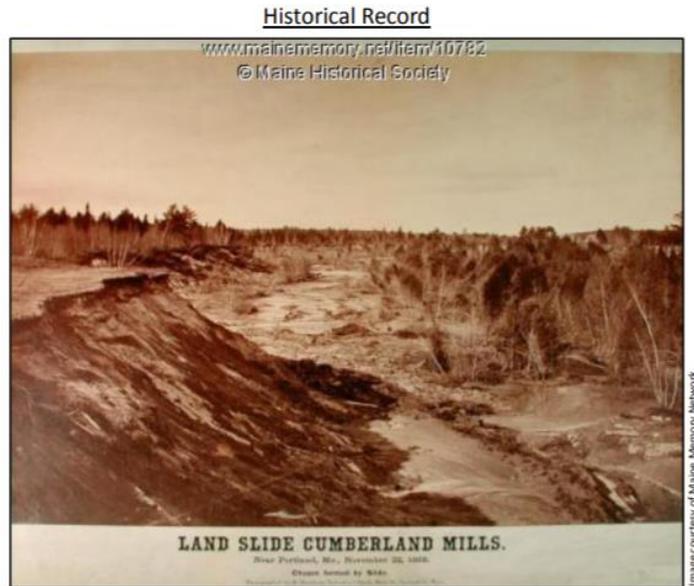
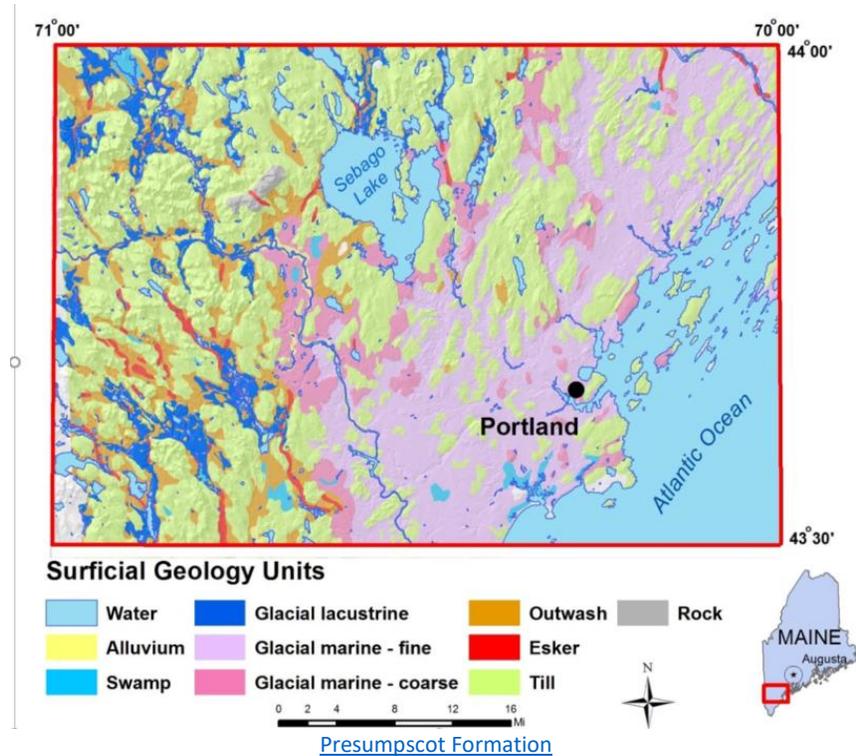


Figure 2. A photograph from November 22, 1868 looking north into the Westbrook landslide from above a steep embankment. This shows the sidewall relief of the landslide. The lower slide zone has blocks of land with trees that tilt away from the camera. The flow direction was toward the bottom of the picture. (See Buchholz, 1968.)

Location: The Presumpscot Formation underlies a significant portion of coastal Cumberland County, as can be seen in the map below. This encompasses some of the most developed areas of the County.



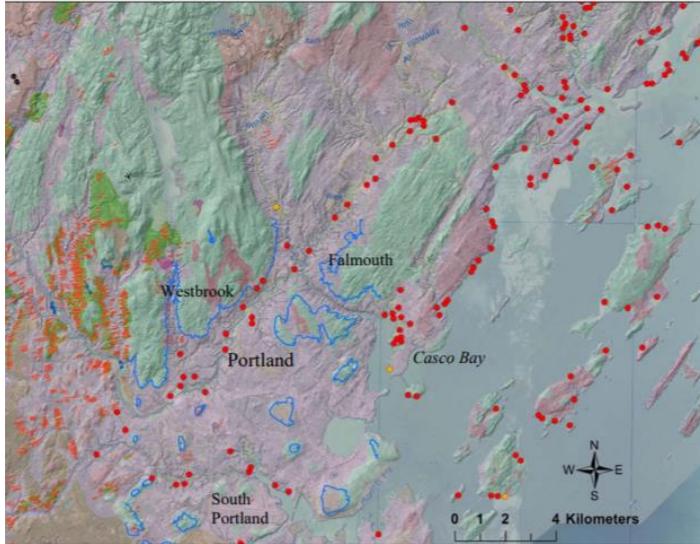


Figure 1. Shaded relief location map of greater Portland and Casco Bay. Red circles denote locations where geomorphology visible in LIDAR data suggests the location of a landslide. The orange dots are areas with steep headwalls. The black symbols are where glacial striations were measured. The glaciomarine Presumpscot Formation is shown in lavender and Pleistocene glacial till is in light green. Other Pleistocene marine deposits are illustrated in dark green and tan. Blue lines indicate late Pleistocene “shorelines” when sea level was higher than present, red lines are glacial moraines. Shaded relief based

on LIDAR and courtesy of the Maine Office of GIS. [Presumpscot Formation Landslides](#)

Extent: There is insufficient data to say with any certainty how often a landslide might occur or how large such an event might be, but the Maine Geological Survey provided the above map indicating past landslides, most of which occurred before recorded history of the area

Impact: The 2020 landslide caused damage to two businesses in the immediate area, with losses to buildings and supplies. Loss of land and resulting instability added to the overall cost. No cost estimate was available at the time of this writing. Depending on the exact location of the landslide, the damages could be minimal or devastating.

Past Occurrences: While there have been several minor landslides in the recorded past, the two biggest have been the two described above.

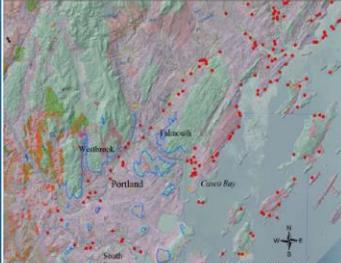
Probability of Future Occurrences: Since the Presumpscot Formation lies under much of the urbanized area of Cumberland County, the probability of a future event, while unpredictable in timing, is somewhat likely. This is in line with the NW THIRA.



Landslides

- Everybody knows about the Presumpscot Formation now!
- https://umaine.edu/presumpscot-symposium/wp-content/uploads/sites/425/2015/10/Dickson_Johnston_2015_Presumpscot.pdf
- <https://www.maine.gov/dacf/mgs/hazards/landslides/index.shtml>
- Maine Geological Survey has some great resources

Likelihood Scale	
1	Unlikely
2	Somewhat Likely
3	Likely
4	Highly Likely
5	Certain

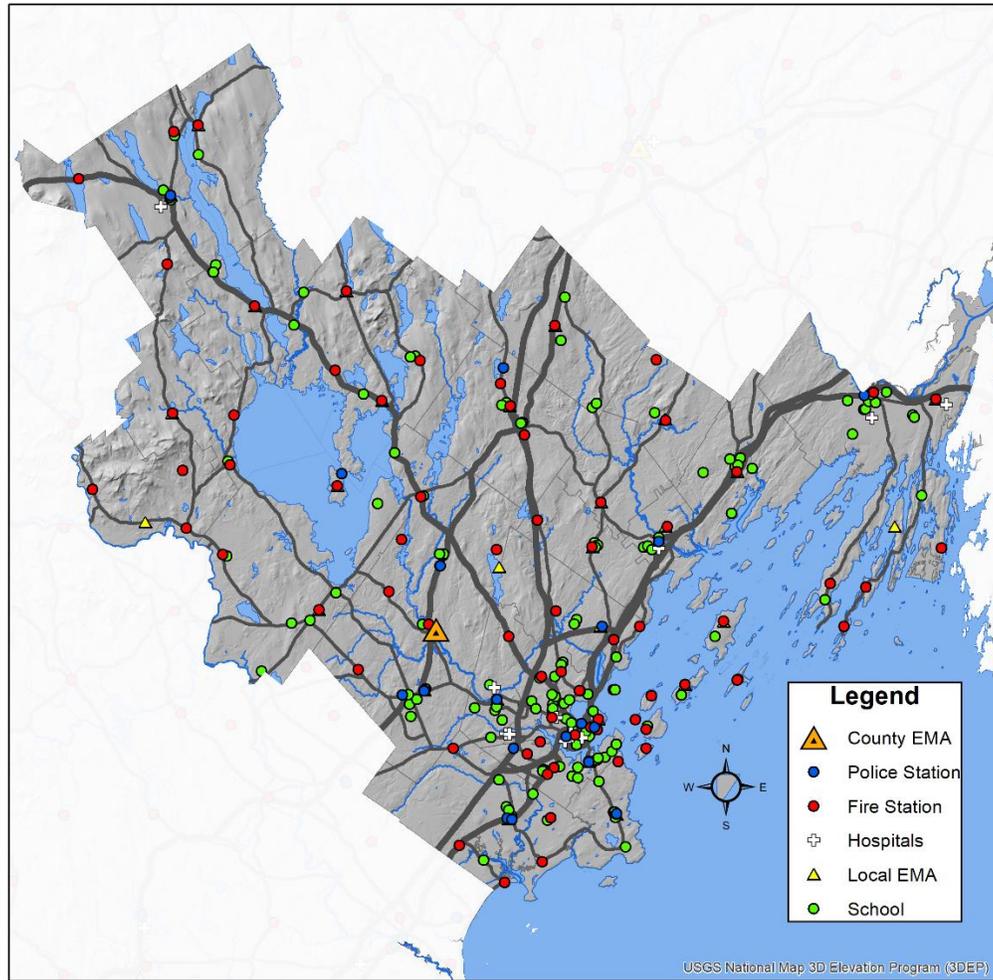


Vulnerability to all Hazards

Requirement §201.6(c)(2)(ii)(A):	The plan should describe vulnerability in terms of: The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;
Requirement §201.6(c)(2)(ii)(B):	An estimate of the potential dollar losses to vulnerable structures identified in ... this section and a description of the methodology used to prepare the estimate

All maps in this section are courtesy of Samuel Roy, Maine Emergency Management Agency Natural Hazards Planner.

The map below displays the type and distribution of common critical facilities located in Cumberland County. Critical facilities represented in this map include Fire stations, law enforcement, schools, hospitals, and county/local Emergency Management Agency offices.



**Critical Facilities
Cumberland County
Hazard Mitigation Plan**

0 5 10 20 Miles

Data sources: Maine Office of GIS, U.S. Geological Survey, FEMA, Homeland Infrastructure Foundation Level Data, Cumberland County Emergency Management Agency

Assessing Vulnerability: Estimating Potential Losses

Overview:

This section of the Plan relies on historical damages as the basis for estimating worst-case future losses, subject to the following:

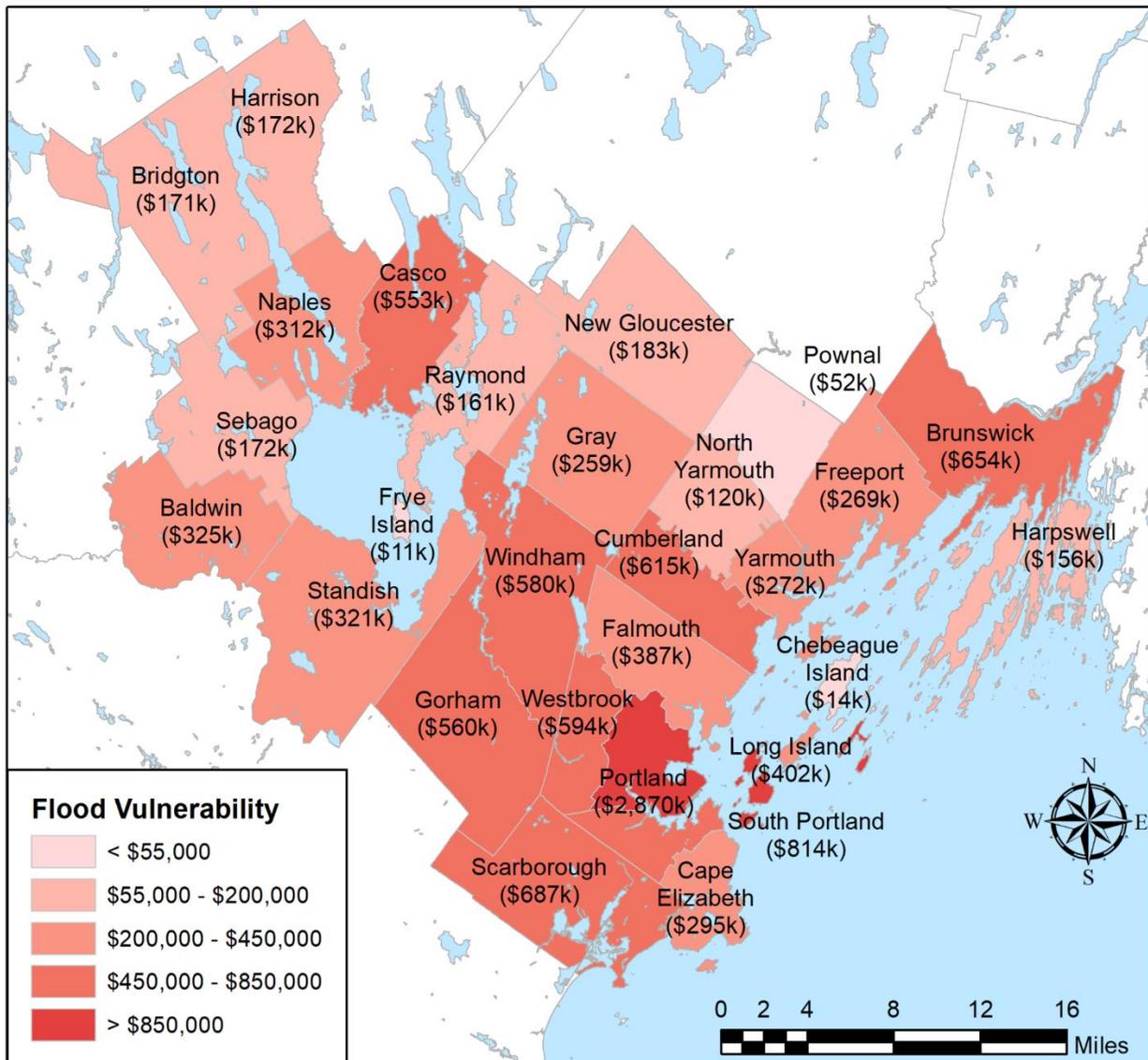
- Presidential Disaster Declarations have been used where possible, updated for inflation using the Consumer Price Index Inflation Calculator from the U.S. Department of Labor, Bureau of Labor Statistics (https://www.bls.gov/data/inflation_calculator.htm).
- Where statewide or county damages are used to determine damages for a specific jurisdiction, the damages are pro-rated using 2019 American Community Survey 5-year population data (<https://www.census.gov/programs-surveys/acs>).
- Per capita costs are used to model potential increases in damage costs associated with developmental growth in participating jurisdictions. The per capita cost is calculated by first using the Inflation Calculator to convert original damage costs to 2019 currency values, then dividing this cost by the population during the year of the disaster. Multiplying the per capita value with

the current population will then provide a damage cost estimate corrected for increased inflation and development.

- **The methodology for calculating worst-case potential losses in Cumberland County is to assume the greater of 1) actual damages updated using the Inflation Calculator, or 2) projected damages based on per capita values.** Where actual damage figures are not provided for individual jurisdictions, only per capita values are used (available for 2007 Patriot's Day Storm and Ice Storm of 1998).

Flooding. This plan uses worst-case, real-life damages to calculate potential flood losses, and assumes that historic patterns will hold for the future. The worst-case flood is the Patriot's Day Flood of 2007, which resulted in a Presidential Disaster Declaration of \$7,145,955 in damages to Cumberland County alone. The per capita cost is used to model potential increases in damage costs associated with increased development in Cumberland County since the disaster event. The per capita cost of \$31.86 for the 2007 Patriot's Day Storm is calculated by taking the 2007 Cumberland County population (276,560) and dividing it into the total 2007 flood damages, converted to 2019 dollars (\$8,810,962.52). The final 2019 projected flood damage cost for a storm of similar magnitude (\$9,398,540.55) is calculated by multiplying the per capita cost (\$31.86) to the current population of Cumberland County (295,003). However, actual costs for some jurisdictions exceed the per capita estimates for 2019. **When assuming the greater of actual damages or per capita-based damages aggregated across all participating jurisdictions, the total projected damages for a storm of equivalent magnitude in 2019 is**

\$11,981,145.41 to Cumberland County alone.

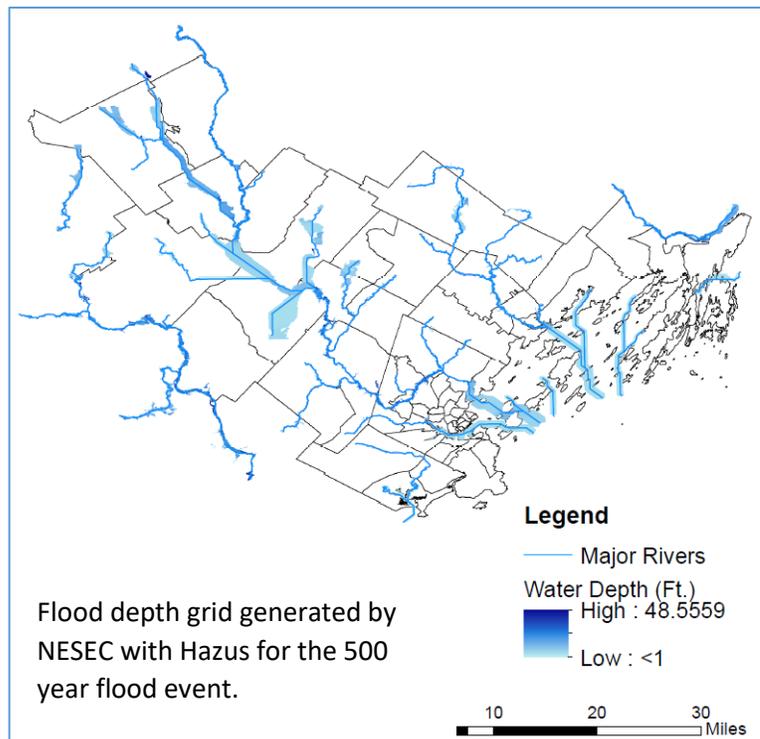


NESEC report on Flooding: In 2020, the North East States Emergency Consortium (NESEC) completed quantitative reports on the potential impacts of major flooding, hurricane, and earthquake events. Results of these reports are summarized in this report, and the full NESEC reports are provided in Appendix 3: Risk Assessment (the earthquake report is provided only as an annex because this hazard is not profiled for Cumberland County). Reports were generated using Hazus, a program for modeling large hazards, community vulnerabilities, and losses associated with impacts. The Flood Impact Analysis Report was generated based on the impacts of a major flooding event that probabilistically has a 1 in 500 chance of occurring in a year. This model differs from our historic and per capita model in that there may be no comparable event in recorded history for Cumberland County. **The Flood Impact Analysis report is used for the potential dollar losses, as flooding is the most frequent disaster with a loss study.**

	Capital Stock Losses			Income Losses					Total Loss
	Building Loss	Contents Loss	Inventory Loss	Building Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	
Maine									
Cumberland	118,803	124,705	3,065	2.00	29,985	50,942	87,185	15,952	430,637
Total	118,803	124,705	3,065	2.00	29,985	50,942	87,185	15,952	430,637
Scenario Total	118,803	124,705	3,065	2.00	29,985	50,942	87,185	15,952	430,637

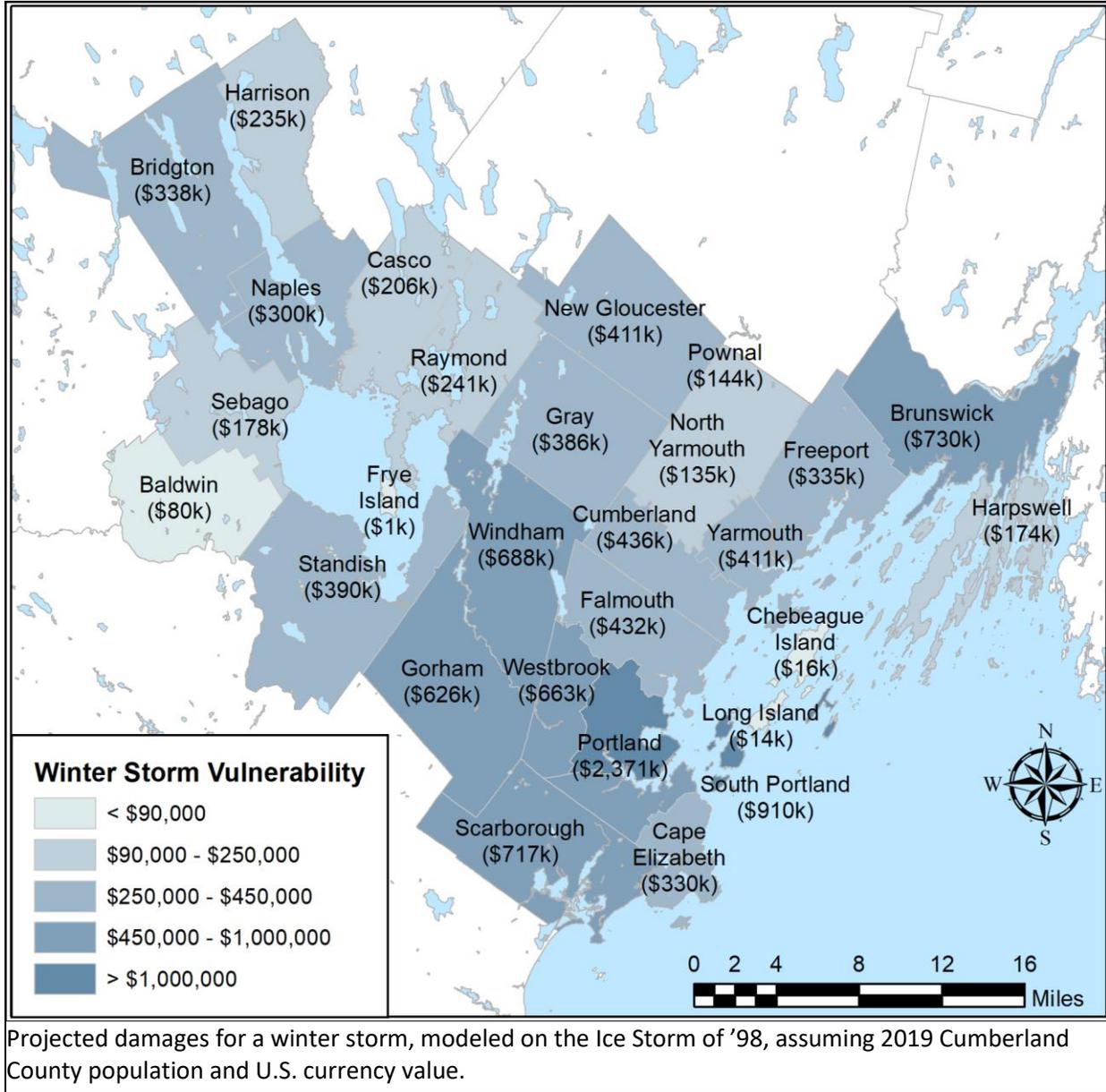
Results from the NESEC Flood Impact Analysis Report project comprehensive losses that are nearly greater than forty times the losses from the 2007 Patriot’s Day storm, with substantial losses to building stock, inventory, and protracted losses associated with relocation and lost wages of impacted residents. In this model, flooding and associated damage is pervasive inland and along the coast.

The Hazus program maintains models for estimating the risk of damage from earthquakes, floods, hurricanes, and tsunamis. Each Hazus model uses inventory information (buildings, infrastructure, and population),



hazard extent and intensity data, and damage functions to estimate the impacts of disasters. Estimated impacts vary by model, but include building damages, economic losses, displaced households, casualties, debris, and the loss of function for essential facilities. The Hazus program provides default datasets for each of these inputs so that any community can quantify risk, regardless of data availability. However, users can modify all Hazus model inputs to include more accurate local information. [Models and Analysis](#)

Winter Storms: The winter storm of record is the 1998 Ice Storm with damages of \$5,775,274, or \$9,058,517.27 in 2019 dollars, to Cumberland County alone. Similar to the Patriot’s Day storm of 2007, the Ice Storm of 1998 cost \$35.60 per capita. (1998 population of Cumberland County 254,429; storm cost in 2019 dollars \$9,058,517.27; Census figures from U.S. Census Bureau American Community Survey).

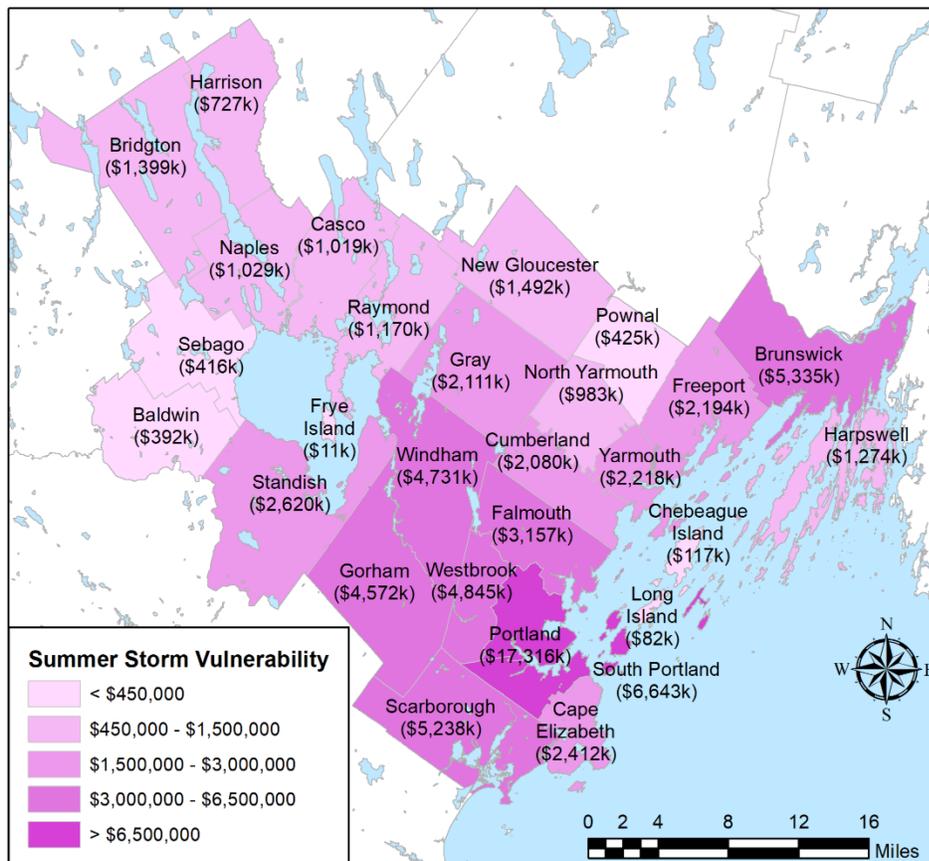


The final 2019 projected cost of ice storm damage for a storm of similar magnitude is calculated by multiplying the per capita cost (\$35.60) to the current population of Cumberland County (295,003). However, actual costs for some jurisdictions exceed the per capita estimates for 2019. When assuming the greater of actual damages or per capita-based damages aggregated across all participating jurisdictions, the total projected damages for a storm of equivalent magnitude in 2019 is \$11,898,759.35 to Cumberland County alone (map above).

Summer Storms: This plan uses worst-case, real-life damages to calculate potential summer storm damages, and assumes that in the future, the historic pattern will repeat itself. Hurricane Edna (1954) was the most devastating summer storm to hit Maine, impacting the State ten days after Hurricane Carol (DR 24) and causing an estimated \$25,000,000 in damages (from US Weather Bureau Office ([Hurricane Edna](#))). The Disaster Declaration was for the entire state.

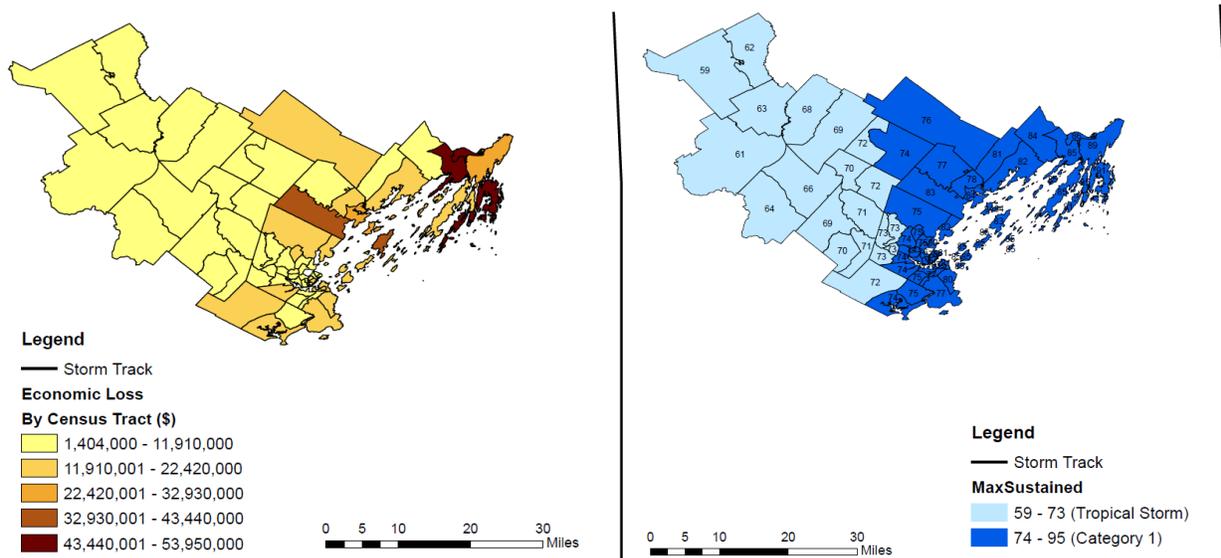
The damage in 2019 dollars would be approximately \$238 million (multiply \$25 million by 9.504– the inflation factor from 1954 to 2019). There has been substantial development, especially in the coastal areas since 1954, suggesting that a modern storm with equivalent magnitude would cause substantially greater damage. The low incidence of hurricanes in Maine keeps this within the category of summer storms; however, if hurricane probability were to increase, it would be included in future updates of the plan as a High Priority.

The methodology for calculating potential summer storm damages in Cumberland County is based on per capita damages that occurred in the State of Maine in 1954 with Hurricane Edna. The population of the State during the event (from the 1950 census) is 913,774. Divide \$238 million (the 1954 damages in 2019 dollars) by 913,774 to get a per capita cost of \$260. Multiply each town’s population by \$260 to get potential summer storm damages. By aggregating per capita-based damages from each participating jurisdiction the total projected damages for a modern hurricane of equivalent magnitude is \$76,005,821.13 to Cumberland County alone. (See map below)



Projected damages for a summer storm/hurricane, modeled on Hurricane Edna 1954, assuming 2019 Cumberland County population and U.S. currency value.

NESEC hurricane report: The NESEC Hurricane Impact Analysis Report develops a worst-case hurricane scenario for Cumberland County. The chances of a severe hurricane occurring in the northeast are low to moderate, however this scenario does not necessarily represent the greatest impact a hurricane could have to the region. In this scenario, the storm track passes just east of Cumberland County, with easternmost jurisdictions experiencing sustained Category 1 hurricane winds, including the most populated city in the state, and western jurisdictions experiencing tropical storm level winds (map left below). Substantial economic losses from this scenario total \$839,008,000 (Map right below), or approximately 11 times greater than projected losses from the Hurricane Edna model. Though not shown here, the model projects 205 displaced households, residential housing is hardest hit in this scenario, and tree debris approaches 520,000 tons.



Drought: Loss of crops is a primary damage expected during a severe drought. While it might be expected that a drought would result in extensive wildfires with subsequent loss of structures, fire prevention is well established in Cumberland County and the anticipated risk of wildfires is considered to be minimal, based on assessment of the most recent County THIRA. Future assessments may differ.

According to the 2017 Census of Agriculture prepared by the United States Department of Agriculture, National Agricultural Statistics Service, there are a total of 50,021 acres used for farm operations in Cumberland County, resulting in commodity totals of \$25,644,000, or \$512 per acre. A drought that resulted in a total loss of commodities would therefore cause a loss in sales of \$25.6 million. Droughts resulting in less widespread loss of crops would result in smaller losses:

- 10% loss in commodities sales: \$2.56 million
- 25% loss in commodities sales: \$6.41 million
- 50% loss in commodities sales: \$12.82 million
- 75% loss in commodities sales: \$19.23 million

U.S. Farm Census

Landslides: Though the scale of landslides in Maine is generally local, often covering an area no more than a few acres at most, they can have much broader impacts to communities if they occur near roads, water mains, power lines, and other critical infrastructure. There are no economic loss models available that are specific to Maine landslides, but losses could be potentially severe. For example, a landslide that occurred in Rockland during the spring of 1996 damaged two homes and displaced about 3.5 acres of land. To prevent further damage to a nearby road, the town contracted a geotechnical firm to buttress the unstable bluff using a complex combination of lightweight and heavy fill to prevent further disturbance. There were no losses in life, but the total losses and response/recovery costs exceeded \$750,000 in 1996 US dollars, or \$1,222,072 in 2019 US dollars ([Maine Geological Survey](#)). As shown above, the geologic record of landslides in Maine indicate that similar events and associated losses are expected to occur in the future.

Requirement §201.6(c)(2)(iii):	For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction’s risks where they vary from the risks facing the entire planning area.
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Municipal Risks

Municipal risks have been derived from the Local Mitigation Surveys, research on each town, and feedback from emergency management directors and public works directors. FEMA preliminary flood maps and [NESEC maps](#) are used throughout this section. For information on flood map zones, see [FEMA Flood Zone Definitions](#). All population statistics are from the 2019 census estimates. Most of the profiled risks are experienced by the entire county, so municipalities focused, for the most part, on areas of their town where risk is most severe and which varied from other towns.

Baldwin

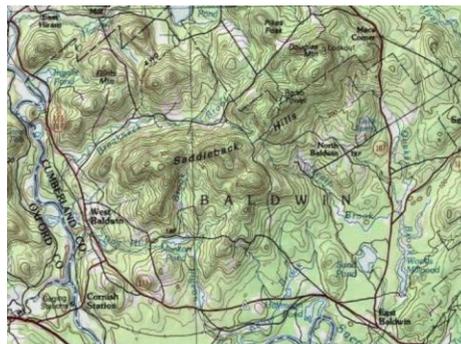
Baldwin is the third smallest town in Cumberland County, situated on the western edge of the County. It encompasses the areas called East, West, and North Baldwin. Routes 113 and 107 are the main transportation routes through the town.

The map below, courtesy of NESEC, shows the five-hundred-year flood possibility. The hilly terrain of the town creates drainage problems during heavy rainfall or snowmelt, causing road damages.

Pigeon Brook Dam (also known as Sanborn Dam) is listed by the Maine Emergency Management Agency as a significant hazard dam as it lies just north of the major Route 113.



500 Year Flood Map (NESEC)



USGS Topographic Map

Additional critical infrastructure includes a large solar farm being developed in West Baldwin off Route 113 near the Hiram town line which has not yet been added to the critical infrastructure maps.

A large family campground was recently developed off Senator Black Road, which is the subject of some of the mitigation projects listed in the Strategy Section. The town has added monitoring of this situation to the Strategy Section of this Plan as the additional traffic may result in damage to the road already being flooded in heavy rains.

Bridgton

Bridgton is a town of over 5,000 people and serves as a regional hub for the area. It is also a seasonal destination due to its many ponds and its border on Long Lake. Skiing bring tourists in the winter months. There are six summer residential camps for children in Bridgton.

Route 302 is a major thoroughfare running through the center of town, and there have been issues with the street being blocked to traffic during heavy rains or rapid snow melt. In 2020, Bridgton redesigned the area and the town is now monitoring the site.

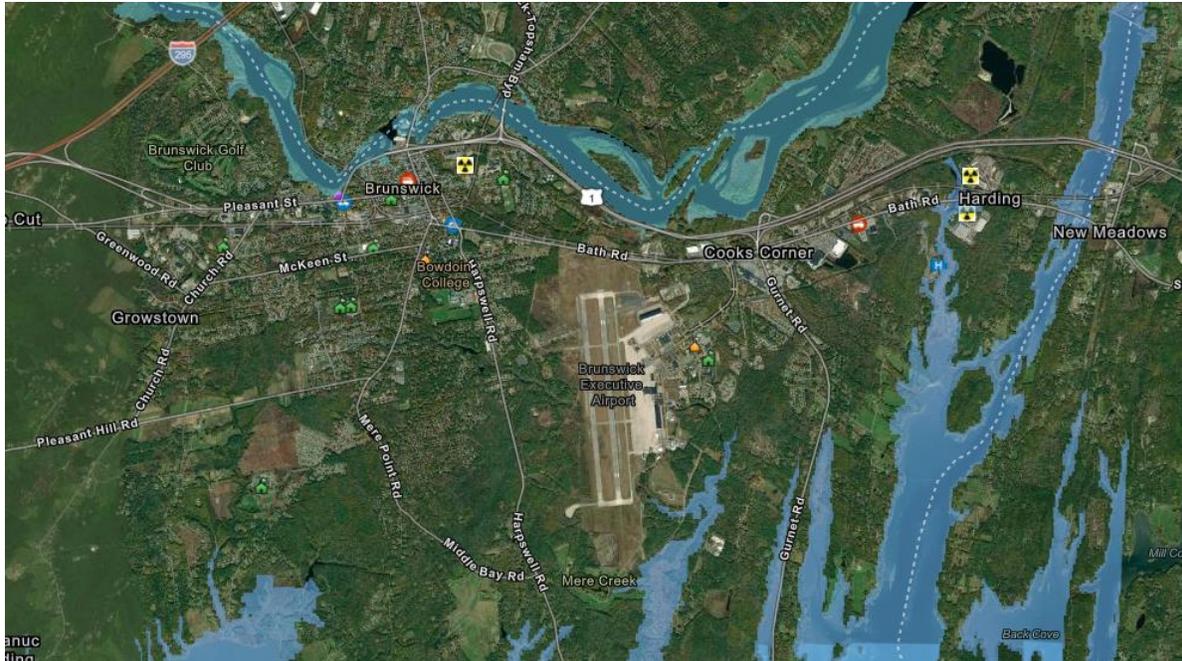


Bridgton Hospital is a critical access hospital serving western areas of the County for residents who would otherwise need to travel about 45 miles for hospital access.

Brunswick

Brunswick is the fourth largest town in Cumberland County, with over 20,500 residents. It hosts the Brunswick Executive Airport. The town is served by Interstate 295, U.S. Routes 1 and 201, and Maine State Route 24, Maine State Route 123 and Maine State Route 196. Amtrak's Downeaster service terminates in Brunswick.

The town is bordered on the north by the Androscoggin River and on the east and south by the Atlantic Ocean. Heavy rains and snowmelt can cause flooding along the Androscoggin River, and some areas along the Atlantic coast that had been previously dry, are now seeing flooding in heavy storm events.



500-year flood (NESEC)

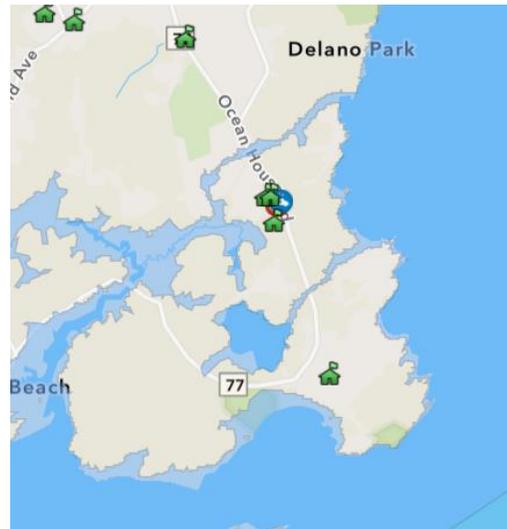
Midcoast Hospital is a 93 bed full service community hospital. Additional critical infrastructure includes Bowdoin College with a student population of 1830, and two industrial ship fabrication facilities for Bath Iron Works (a defense contractor). Ken Brilliant, Brunswick Fire Chief/EMA Director adds “We have a couple of fuel suppliers in town with large storage tanks. Downeast Energy has a 1-million-gallon fuel oil tank located just off of Pleasant Street. They also have a large propane plant with four large propane tanks on site, located off of Bibber Parkway in the industrial park. Across the street from this facility is Crowley Energy where they store both heating fuel and have a bulk storage propane facility. Dead River has a facility in the same industrial park with bulk storage for heating fuel and propane.” (email Feb 9, 2021)

Sagadahoc County, bordering Brunswick, added this:

- Old Bath/Old Brunswick Rd. which connects the northern side of Brunswick to Bath goes over the northern portion of the New Meadows River. The road is low lying with minimal land space on either side. If changes in water levels are to be taken into account in the updated plan, it would be beneficial to determine how the sea-level rise would affect this stretch of road.
- The Frank J Wood Bridge connecting Maine St. Brunswick to Main St. Topsham is in very poor condition. There have been talks on repairing it vs. replacing it, however it appears that there will end up being a lengthy process on deciding which route is taken. The bridge provides a main point of access for residents of both towns, as well as quick access for Mutual Aid situations from Police, Fire & EMS

Cape Elizabeth

Cape Elizabeth is a town of nearly 9,300 residents. Its main thoroughfare is Route 77. It is home to two State Parks: Crescent Beach and Two Lights. The Spurwink River, Willow Brook River and Pond Cove Brook transect the town.



500 year coastal flood map.

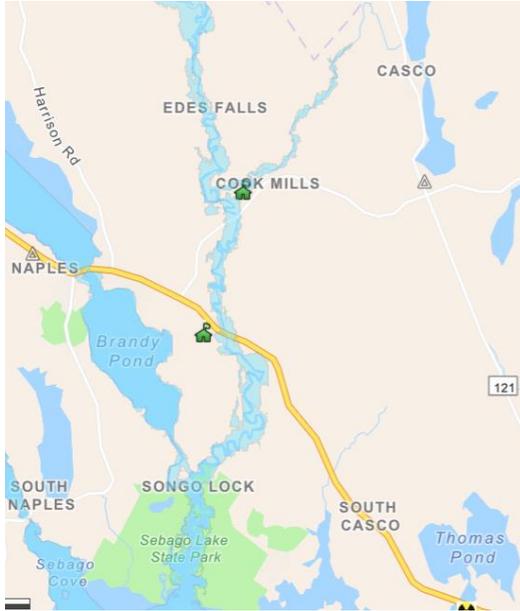
Note from this map that during a 500-year flood, a large section of the town could potentially be cut off from the mainland, with Route 77 overtopping in four areas. This could prevent access by Cape Elizabeth emergency and other vehicles. Note that most of Cape Elizabeth's infrastructure lies in the central area that could be isolated.

Casco

Casco is a town of over 3,900 hundred residents, located north and bordering Sebago Lake. There are eight ponds and lakes within its borders. The population swells to over 15,000 during the summer between children's summer camps and seasonal resorts. As of 2020, there were 7 children's camps in Casco, including Camp Sunshine, an illness/ special needs camp.

U.S. Route 302, a major east-west road, runs through the southern section of the town. Other major routes include Stat routes 11 and 121.

The map on the left, below is from the NESEC 500-year flood projection, and focuses on the Crooked River, which borders the southwestern part of town. The second map, from the Maine Floodplain Management Program shows the preliminary maps for the lower end of Pleasant Lake and its proximity to the center of town.



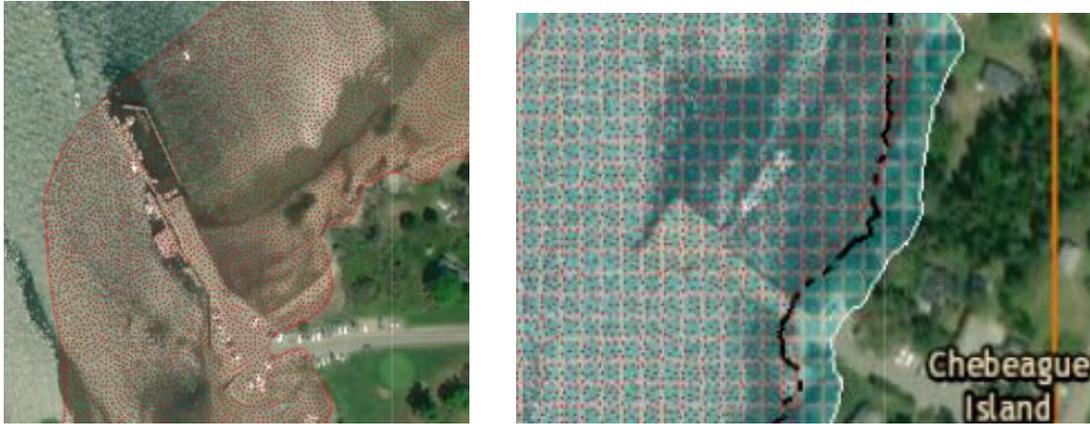
Chebeague Island

Chebeague Island lies in Casco Bay off Portland. The town is comprised of 17 islands, only two of which, Great Chebeague and Hope, have year round residents. According to 2108 census estimates, there are 349 year-round residents. Some estimates indicate that the population triples during the summer.

Casco Bay Lines (Portland, island south terminal) and the Chebeague Island Transportation Company (Yarmouth, island north terminal) are the two ferries that provide access to the Island. [Ferry Landings](#)



The map on the left below shows the preliminary FIRM map for the Chebeague Island Ferry Terminal, and the one on the right shows the Casco Bay Islands terminal.



In high seas, either ferry may be cancelled, leaving the island residents without access to the mainland. The Chebeague Island terminal has seen storm damage and Chebeague Island has two projects in the Strategy Section of this plan to mitigate these critical infrastructures. Indian Point Road, leading to the Casco Bay Island landing, is already experiencing significant shoreline erosion.

On the seaward side of the Island, the Chebeague Island Boatyard, with the town's U.S. Post Office (seen in the picture below closest to the water, and the town's only source of gasoline, are at risk.



Cumberland

Cumberland is a town of close to 8,000 residents, with three distinct areas: Cumberland Center, which is the center of government and education, according to the town website [Cumberland Maine](#), Cumberland Foreside and West Cumberland. Several major routes run through Cumberland, including Interstates 95 and 295, US. Route 1 and 302, and State routes 9 and 100. Cumberland is also home to the Cumberland Fair, one of the State's largest agricultural fairs.

One of the biggest concerns for Cumberland is their communications system, which has an effect on public safety. "The current two-way radio system is not integral with Cumberland County Regional Communications Center. The topography of the Town of Cumberland is presently not commensurate with continuous radio signal strength to the public safety dispatch for police, fire and EMS." Fire Chief/EMA Director Dan Small, Municipal Mitigation form response, 2021) During storm events, this can lead to failures in the communications system, delaying emergency services.

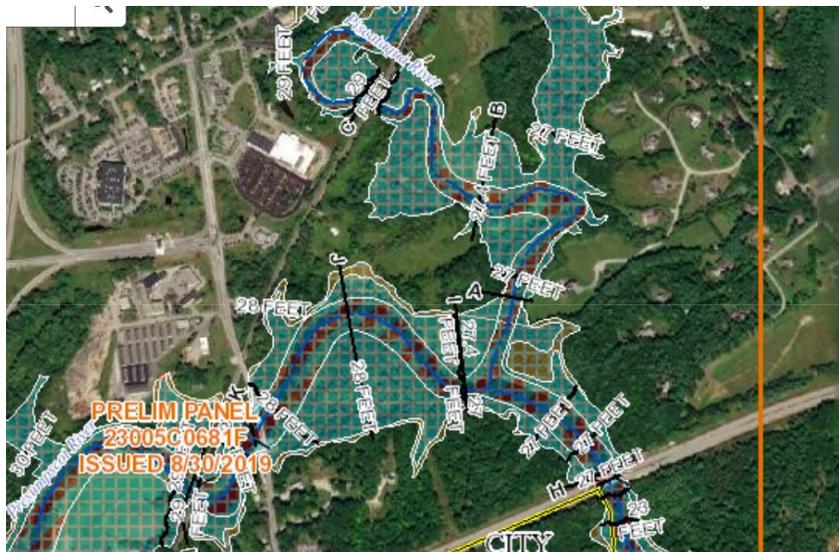
The FEMA preliminary flood map shows the area of the East Branch of the Piscataquis River, which is the most likely spot for flooding in the town, at its confluence with several brooks.



Falmouth

The Town of Falmouth has an estimated population of 12, 141.

Interstate 95, 295 and the Falmouth Spur, U.S. Route 1 and State routes 9,26, 88, and 100 run through the town.



The map to the left shows the confluence of the Presumpscot, Piscataquis and West Branch of the Piscataquis Rivers from the FEMA preliminary flood maps. This shows that several roads in the town are subject to over-flooding during a 500-year event. Several of the 2022 projects in the Strategy Section of this Plan address some of these issues.

Permitting for some projects and, in some cases, property rights issues are two of the obstacles facing the Town as they attempt mitigation.

If the culvert at Norton Brook were to fail, Sedgewood Nursing Home, a specialized dementia support home with 91 beds, would be cut-off without land access, as would two other medical office facilities. The map below shows the Norton Brook/Northbrook Road crossing.



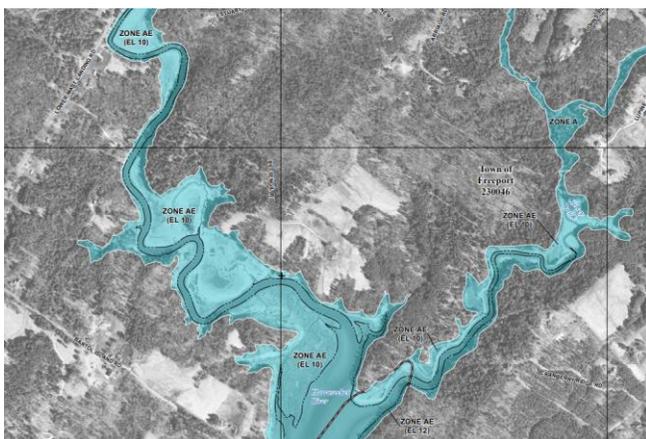
Freeport

Freeport is located approximately twenty minutes from Maine's largest city, Portland, along the northern reaches of picturesque Casco Bay. Its 37 miles of tidal coastline include numerous inhabited islands, as well as a mix of rocky shoreline, iconic Maine clam-flats, and riverine and estuarine ecosystems. The Harraseeket River serves as the Town's primary deep-water harbor, and is one of the more protected anchorages in Casco Bay.

The Town hosts a large retail area, anchored by L.L. Bean Co. This area is a top tourist attraction in the State of Maine, increasing traffic flow in the town, especially during the summer and the holiday season.

The town is served by Interstate 295, U.S. Routes 1, 125, and 136. Amtrak's Downeaster stops near the retail area.

The Harraseeket River is the greatest possible source of flooding in the town, especially in situations where high tides and major storms occur together. This could affect South Freeport Road residences, leading to longer first responder response time.



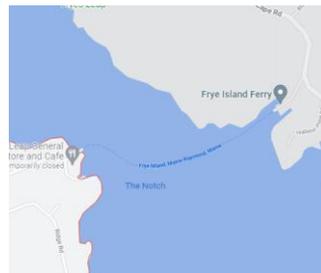
Bustin's Island is a Village Corporation within the territorial boundaries of Freeport, but is a self-governing entity. The ferry landing in Freeport is in the Harraseeket River



Wolfe’s Neck State Park also resides in Freeport.

Frye Island

Frye Island is located in Sebago Lake approximately 25 miles west of Portland, Maine. Frye Island is a seasonal town, open only from May through October. The ferries that service the island run from the terminal on Cape Road in Raymond, Maine. There are no State or federal roads on the Island.



The Long Beach Causeway is the most likely source of flooding on the Island. This road serves the Long Beach Marina.



The Island is heavily forested, and is therefore susceptible to forest fires.

Gorham

Gorham is a town of about 17,582 people. It is home to one of the two campuses of the University of Southern Maine (total student population over both campuses 7,855). The town encompasses several unincorporated hamlets such as Little Falls, White Rock, and North Gorham.

U.S. Route 202 and State Roads 25, 112, 114, 237 are major thoroughfares through town. The Presumpscot River borders sections of Gorham.

According to the local EMA Director and the Town Planner, “Gorham has multiple large, medium, and small rivers and streams which has the potential for flooding due to more frequent storms events affecting homes and Town infrastructure. Droughts have the potential to affect active farms and woodlands in north and west Gorham as well as single-family homes on wells located throughout Gorham. Major storm events will likely affect road drainage infrastructure drastically effecting commuter, residents, and emergency traffic flows.



A portion of Route 22 at the Stroudwater River, Gully Brook joining, close to the South Gorham substation

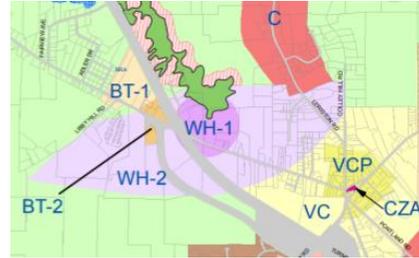
Gray

Gray is a town of 8,223 people. It encompasses part of Forest Lake, most of Little Sebago Lake and all of Crystal Lake. Interstate 95, US Route 202, and State roads 4, 26, 115, and 100 run through the Town. The Maine Department of Inland Fisheries and Wildlife maintains a fish hatchery and wildlife park in Gray.

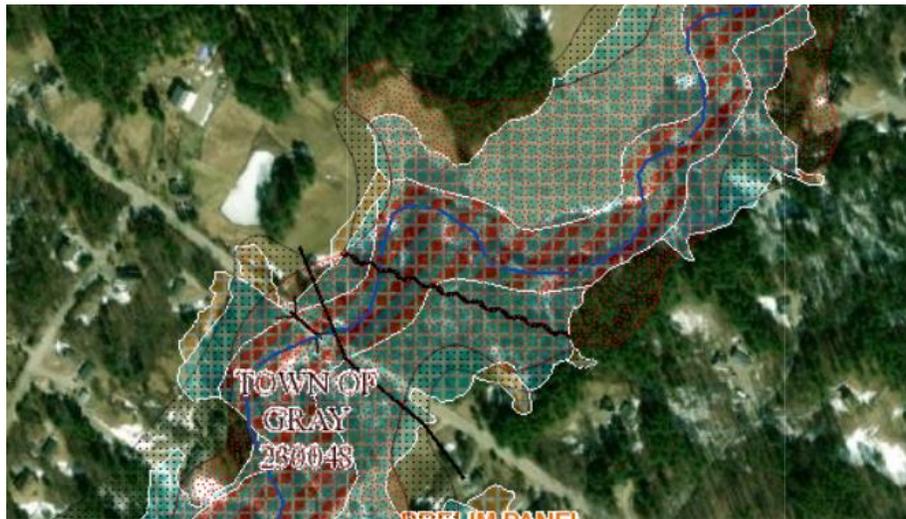
Of particular concern for the Town of Gray is the water supply system. According to the Gray EMA Director, “We currently draw water from the area designated as Wellhead 1 in our zoning. The concern I have with this is that the Maine State Turnpike runs directly through this zone. The watershed itself encompasses a much larger area... If we were to have a hazardous materials spill on the turnpike, then everyone that subscribes to the Gray Water District would be affected.

The area marked WH-1 is the Wellhead area of concern.

[Gray Zoning Map](#)

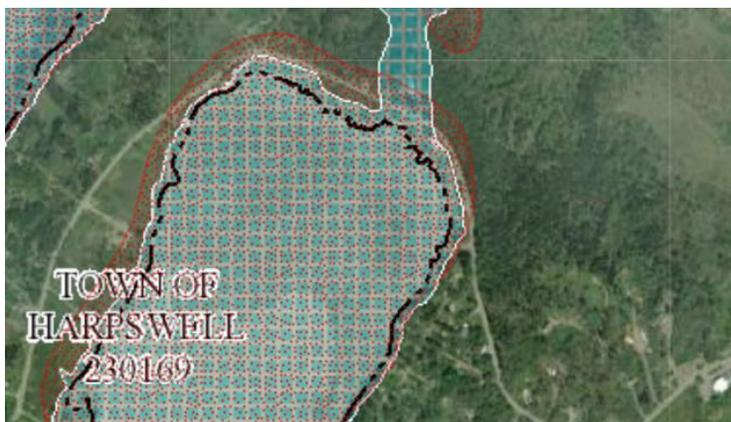


For other areas that might be susceptible to flooding, the main threat is to transportation. Flooding along the Pleasant River can overflow several roads.



Harpswell

Harpswell is a town of 4,898 people, which grows to 10-12,000 during the summer. The town consists of one peninsula and three large island connected by bridges. There are also several smaller islands accessible only by boat. State Roads 123 and 24 are the primary roads. The town is very proactive in assessing its vulnerability to climate changes. It has participated in several studies, links to which can be found here [Climate Resilience](#).



One of the major concerns is Basin Point Road, which is a single access road to the lower part of the West Harpswell peninsula. Studies are in process to determine the best solutions to the low lying road's flooding.

Other areas of concern, as determined by the local EMA Director, are: 1) Mackerel Cove, Bailey Island, flooding 2) Long Point Road, flooding, 3) Rt. 123 at Brunswick line, flooding, 4) Oakledge Road, tree damage during storms, 4) Potts Point, flooding, 5) Wallace Shores Road, flooding

Harrison

Harrison is a town with a population of 2,795. The population swells during the tourist season in the summer, as the town borders Long Lake and encompasses Crystal Lake. Crystal Lake flows into Long Lake through downtown Harrison.

In addition to the summer tourists, Harrison has four residential summer camps for children, with a total capacity of 1,175 children plus staff.

The main roads are State Roads 35 and 117. One of the areas of highest concern is Rt. 117 at Crooked River.



Harrison is the only town in Cumberland County with a FEMA approved debris management plan.

Long Island

Long Island is a town in Casco Bay, about six miles off the coast of Portland. The only access is by ferry, water taxi, or private boat. The estimated population of Long Island is 314 year-round residents, swelling to over 1,000 in summer. The Island is home to a 125-acre conservation area and a fresh water marsh.

The Island is served by Casco Bay Lines, which can transport vehicles to Long Island and several other islands in the Bay. The service operates out of Portland. The company also provides passenger transportation. The ferry docks at Ponce Landing on the leeward side of the Island.

Long Island maintains an elementary school, but ferries its Grades 6-12 students to Portland for schooling. Any disruption in ferry service affects the ability of students to get to Portland.



Naples

Naples is a town of 3,957, situated in the heart of the Lakes Region. It encompasses all of Brandy Pond and Tricky Pond, and parts of Long Lake, and part of Sebago Lake. The Crooked River borders much of the eastern side of town, and the Songo River connects Brandy Pond to Sebago Lake. Songo Lock is the last remaining lock of the 19th-century Cumberland and Oxford Canal, and controls the elevation of Long Lake via Brandy Pond.

The map below shows an area just south of the Causeway which is susceptible to flooding. The Causeway itself has been rebuilt to prevent damage.



U.S. Route 302, and State Roads, 35 and 114 are the major roads through town. Holt Pond Nature Preserve lies partially within the town borders.

Naples is heavily dependent on tourism, and in summer, the population swells to at least three times the winter population with tourists, campers, and outdoor adventurers. Naples plays host to three private residential children's summer camps, with a possible total of more than 1,000 children at any given time in June, July, and August.

New Gloucester

New Gloucester is a town of 5,738, on the northern boundary of Cumberland County. Interstate 95, U.S. Route 202 and State roads 26 and 231 run through the community. Sabbathday Lake lies within its boundaries as do the part of the Royal River, and Westcott Brook.



The preliminary flood map shows the intersection of the Royal River and Route 231 as a possible flooding area during severe storms.

New Gloucester is home to both Sabbathday Lake Shaker Village (home to the only active Shaker Community in the world today) and Pineland Farms, an educational 5,000-acre farm.

During wind storms, the areas around Route 100, 231 and Snow Hill Road sustain the most damage, causing limited access to some areas of town.

North Yarmouth

The Town of North Yarmouth has an estimated population of 3,779. State Roads 9, 115, and 231 transect the town. The Royal River and Chandler Brook run through the town.

Pineland Farms is a 5,000-acre working farm, business campus, and educational and recreational venue that attracts visitors year-round. Chandler Brook Preserve, owned by the Town, provides hiking and equestrian trails and paddling on Chandler Brook.

Parts of town that are most susceptible to flooding include part of Walnut Hill Road because of the steep topography, and West Pownal Road at the crossing of the East Branch of Chandler Brook, shown in the flood map below.



Portland

Portland is Maine's largest city, with a population of 66,595 and is the seat of Cumberland County. Portland is situated on a peninsula in Casco Bay on the Gulf of Maine and the Atlantic Ocean. The working waterfront supports an active fishing industry, shipping, and pleasure craft. The deep water harbor is among the most protected on the East Coast. It is a cruise ship destination.

Maine Medical Center is a Level 1 Trauma Hospital, one of only three in northern New England and it is home to the Barbara Bush Children's Hospital. Northern Lights Hospital is also part of Portland, with two campuses.

Interstate 95 and 295 run through Portland, as does U.S. Routes 1 and 302, along with State Roads 9, 22, 25 and 26. Portland International Jetport (PWM) straddles the Portland/South Portland borders. The Port of Portland is a deep water harbor, among the most protected on the East Coast. It is one of the largest oil ports on the east coast. Casco Bay Ferry Terminal, serving many of the Casco Bay Islands.

There are several areas in Portland that are susceptible to flooding, including this section along Marginal Way which currently floods during astronomical high tides and storms.



The City of Portland completed a comprehensive climate vulnerability assessment to inform development of the One Climate Future climate action and adaptation plan. It identified vulnerabilities to civic infrastructure from climate change, including sea level rise, more intense storm events, and an increasing number of heat waves. It noted that impacts to infrastructure create social vulnerabilities, especially to marginalized communities, due to potential disruption of water systems, transportation networks, and economic activity. City departments including the Department of Planning & Urban Development and Public Works participated in the development of the Climate Action Plan and it is designed to complement Portland's comprehensive plan, Portland's Plan 2030, to inform decision making processes including the multi-year initiative to rewrite Portland's land use code. Portland's Plan 2030 The climate action plan has specific recommendations to create overlay zones to govern development in parts of the city that face the highest risks from sea level rise. These would restrict uses that would endanger vulnerable populations and require buildings to have the ability to withstand storms and inundation. The Sustainability Office and the Planning & Urban Development Department have previously brought draft proposals to the Planning Board for discussion, not yet adopted, but as part of a longer effort to address the long term policy challenges of sea level rise. Portland's Plan 2030 addresses the importance of meeting the challenges of both mitigating and adapting to a changing climate throughout, including in its Vision Statement as well as its policy chapters on the Environment, Historic Resources, Waterfront, Economy, Housing, and Facilities & Services.

Pownal

Pownal is a small rural town of 1,635 residents. The town borders Androscoggin County. It is home to Bradbury Mountain State Park and the Blueberry Pond Observatory. State Road 9 runs through the town

The town is served by three separate CMP service areas which makes coordination and service restoration difficult. Tree trimming has not reached several of the dead end roads with only a few

houses on them. This leaves them susceptible to longer power outages in storms, and when roads are blocked, to delays in access to emergency services.



Two areas on Chadsey road are susceptible to flooding. When this road floods, it cuts off one of the most direct links between Pownal and New Gloucester, one of the town's primary mutual aid partners.

Raymond

Raymond is a town of 4,500 people. According to the town brochure, "Raymond is located on beautiful Sebago Lake and has six other lakes and ponds within its boundaries." [Raymond brochure](#) It is an all season recreational area. The Jordan and Tenny Rivers run through town. U.S. Route 302 and State roads 26, 85, 121 and the major routes through the town.

There are ten brooks and eight other ponds, bogs, or lakes in Raymond, most notable are Crescent Lake and Raymond Pond. The Panther Pond outlet dam is operated by the State of Maine's Department of Inland Fisheries and Wildlife. Spring melts and heavy precipitation create difficulties in controlling the water level, even with the dam in operation.



Panther Pond Dam, a significant hazard dam, beside U.S. Route 302, with flooding potential.



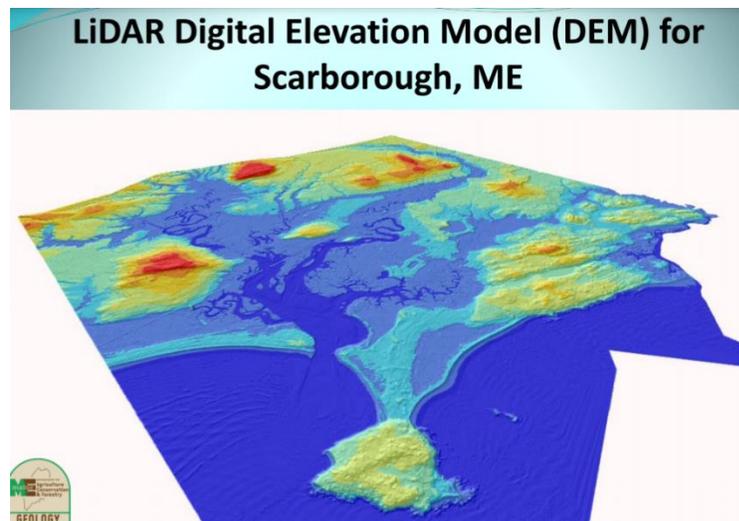
Raymond Neck is the landing for the Frye Island ferry.

According to the local EMA Director, “Traditionally there are several areas which can flood with huge spring rains. One is the area on Egypt Rd near Farwell Brook. It has not flooded in approximately 6 years. The Mountain Road on any of its steep hills as well as Conesca and Spiller Hill roads can wash out in extreme spring rains. Though these areas have not washed out recently and have had extensive culvert and re-build work done recently.” These are areas of town that will continue to be monitored to see if the mitigation actions have been successful.

Scarborough

Scarborough is the southernmost town with 20,146 residents. Interstates 95 and 295, U.S. Route 1 and State Roads 22, 114, and 207 as well as the Amtrak Downeast run through town.

The Nonesuch River meanders through the Scarborough Marsh. The Marsh is a 3,100-acre saltwater marsh, managed by the Maine Department of Inland Fisheries and Wildlife as a wildlife management area. It is the largest contiguous saltmarsh in Maine, and is a critical nesting and breeding area for many species of birds. It is subject to rising sea levels



[Sea Level Rise and the Scarborough Marsh](#)

The study from which this graphic comes discusses the changes to the marsh with different levels of sea level rise.

According to the EMA Director, “Because we are a coastal community with a very large marsh there are certain areas of town and along the marsh that flood more often than others during severe

storms coupled with astronomical high tides. There are also some specific examples of other areas where drainage is insufficient and they include: Sawyer Street near the Cape Elizabeth Town Line, Route 1 near Milliken road, The Brown Homes housing development / Schooner road area, Broadturn Road near Martin Avenue, and Payne Road at Phillips Brook...

Storm tides have caused wide-spread flooding that limits emergency access to those areas as well as adequate egress for residents living in those areas near the coast and marshlands who are trying to evacuate. Flooding of homes in some of the older neighborhoods like Schooner Road where insufficient drainage causes repetitive damage to property during heavy rain events.”



A section of Route 1 that can potentially flood in severe storms.

Sebago

The town of Sebago is home to approximately 1,600 residents and borders the northwest shore of Sebago Lake. U.S. Route 302 is the major route that runs from Portland through the town of Sebago and Maine Routes 11, 107, and 114 connect the town to surrounding areas. There are several smaller bodies of water in the town, including the Northwest River, five ponds, and seven brooks. Chessey Preserve is 109-acres preserved by the Presumpscot Regional Land Trust. Sebago has a total of 46.1 sq. mi., 32.8 of which is land and the rest being water.

Route 114, which runs alongside Sebago Lake is of particular concern to the town. During heavy rainstorms, the catch basins cannot control the flow of water which not only causes overtopping of the road, but is also causing severe erosion on the beach. Because Sebago Lake is the source of drinking water for a large part of the County, the resulting deposits of erosion and pollutants is of significant concern to both the Maine Department of Environmental Protection and Portland Water District. The pictures below demonstrate the problem.



Photos used by permission

This is a decades-long problem, complicated by the fact that it is a State Road, so is the responsibility of both the Town and the Maine Department of Transportation with input from the Maine Department of Environmental Protection and Portland Water District. Private property in the area will also be impacted in an area where average property size s 50' by 50 feet. Several studies have been done, but the project has never reached the funding point. The vehicle counts on the road range from the low 20s in the winter to close to 2,000 per day during the summer. Those low counts and the high estimated cost of the project may contribute to the decisions to postpone.



The map to the left shows the Town marina and the flooding issues on Route 114.

South Portland

South Portland has about 25,548 residents within its 14.3 sq. miles, making it the state's fourth largest community. South Portland lies to the south of Fore River and looks out east onto Portland Harbor. The 31 acres included in Mill Cove nature preserve provides salt marsh and tidal flats and the Clarks Pond area. The Casco Bay, Veterans Memorial and I95 bridges lead from Portland into South Portland. I95, I295, Route 1, and State Route 701 (the Scarborough Connector) runs through

South Portland. It is also home to a large collection of oil tanks, terminals, and piers. There are five marine facilities (marinas, etc.) in addition to the oil terminals. Most of the Portland Jetport (runways and taxiways) is actually situated in South Portland. The largest mall north of Boston is in South Portland as are the two largest semi-conductor manufacturing plants. South Portland is also home to one of the largest warehousing facilities operated by Delhaize (Hannaford's). Southern Maine Community College is located on the very eastern end of the city. The city is known as the tale of two cities, having very dense residential properties on the east side and a robust commercial footprint on the west end of the city.



Two of the projects South Portland has kept for the 2022 Plan concern the Trout Brook watershed. According to the Public Works Director, the City is “doing a hydraulic/hydrologic study on the whole Trout Brook watershed. The study will provide the data for design. The question will be of when we want to replace the culverts (all the culverts in the watershed need to be replaced).

Standish

Standish is home to 10,078 residents within its 59.03 square miles. Within the town is Steep Falls Wildlife Management Area of about 4,000 acres of forest and wetland. Sebago Lake is to the North of Standish and the Saco River borders to the South. Watchic Pond is a 448 acre, 41-foot-deep body of water just Southwest of the town center. Much of Sebago is within the Saco River watershed; the river lies along its western border. A large area in the northern part of the town is the Steep Falls Wildlife Management Area.

U.S. Route 302 and State Routes 11, 25, 35, 85, 113, 114, and 237 all run through Standish.

Saint Joseph's College is located in Standish, which averages about 2,000 students each year.

According to the local EMA Director, one of the big concerns for Standish is the Smith Mills intersection with an inlet to Sebago Lake's Lower Bay. Flooding on this road cuts off about 30 homes from public safety access.



Westbrook

The city of Westbrook has a population of about 18,195 people, which has been consistently increasing since 2000. Presumpscot River flows through Westbrook on its way to Casco Bay. Routes 22, 25, and 302 serve Westbrook. Along Mill Brook is the Mill Brook Preserve, which is 130 acres of forested land and a 6-mile trail system.

Westbrook is home to Calpine Energy. This facility produces enough electric power to meet the needs of more than 500,000 homes throughout New England. Westbrook is also home to two other major corporations: Idexx Labs which develops and manufactures veterinary and livestock products, and Sappi Fine Papers International, which produces casting and release papers.

The Presumpscot River flows through the heart of the city center (see map below) and the Stroudwater River crosses the southern section.



Preliminary flood map showing the center of town and the Presumpscot River.

A three-acre landslide occurred on the Presumpscot River in 2020, temporarily blocking the river, and raising the water level above the blockage to near flood stage. According to the City Engineer, a landslide susceptibility map is needed to direct growth and (re)development in these vulnerable areas. Knowing what factors contributed to the 9/16/2020 landslide should be evaluated in order to inform land use management rules and ordinances on the local and State level. Both technical and financial assistance are needed to complete these steps, so the City has completed a FEMA BRIC grant application to complete the following steps:

- Develop a landslide susceptibility map in partnership with Maine Geologic Survey's landslide expert, Dr. Lindsay Spigel
- Identify contributing factors in partnership with MGS + the University of Maine's geotechnical engineering experts, Drs. Tom Sandford and Aaron Gallant
- Propose changes to local and State policy in partnership with Quebec DOT where landslides causing fatalities shaped public policy on land use management
- Recommend a future mitigation project for FEMA funding in partnership with participating municipalities + landowners

Windham

The town of Windham is about 50.3 sq. miles of land and water and houses about 18,540 residents. It borders the Southeast edge of Sebago lake and the shore of Little Sebago Lake. Highland Lake is on the western edge of town. These Maine lakes bring an influx of tourists during the summer months. It encompasses the villages of North Windham and South Windham (where CCEMA is located).

The main village of the town is North Windham and the routes serving the whole town are U.S. Routes 202, 302, and State Routes 35 and 115. The area around the 115/35 intersection is a major commercial district serving the Lakes Region.

The county's Emergency Management Agency and The Maine Correctional Center are both located in Windham. The Eel Weir Dam, owned by Sappi, controls the level of Sebago Lake, at the headwaters of the Presumpscot River, and is considered a high hazard dam.

The map below shows the Little Falls area of Windham at the Presumpscot River. Windham recently moved its fire station to a less hazardous area. The old station can be seen in the upper left corner of the map. The lower right side of the map shows the Keddy Mill Superfund site.



Yarmouth

Yarmouth has approximately 8,529 residents within 22.9 sq. mi., 13.3 sq. mi. of which are land. The town of Yarmouth includes Cousin's Island which is about a 2.0 sq. mi. landmass in Casco Bay. Cousin's Island is connected to mainland Yarmouth by Sandy Point Bridge and also hosts the ferry terminal for service to Chebeague Island. Little John Island is also part of Yarmouth. Cousins Island hosts the Wyman Energy Center, a peak demand oil-fired electric power plant.

U.S Route 1, and State Routes 88, and 115 serve Yarmouth and there is also access to Interstate 295. The Royal River runs through Yarmouth and spills into Casco Bay.

The annual Yarmouth Clam Festival attracts around 120,000 people (around fourteen times its population) over the course of the three-day weekend.

Little John Island is a big concern for wildfires, as it is an island nature preserve, used by many for recreation, camping and hiking.



It is a heavily wooded island, attached to Cousin’s Island by a bridge, which is in turn linked to mainland Yarmouth by another bridge.

Addressing Vulnerability: Analyzing Development Trends

Region	Number of addressable structures		Change in addressable structures	% change in addressable structures
	2019	2021		
Cumberland County	160,884	165,575	4,691	3.07%
				% of total addressable structures
Special Flood Hazard Areas (SFHA)	1,995	2,020	25	0.53%
Hurricane Evacuation Zones (HEZ)	29,352	29,482	130	2.77%
SFHA and HEZ	1,301	1,296	-5	-0.1%

Hazard Mitigation Plans must include an assessment of changes in regional development that may impact the vulnerability of people and property to hazards. Assessing vulnerability of all participating jurisdictions in Cumberland County is a high priority because it is the most populous county in Maine and because it contains a dense road network, widespread coastal development, and other infrastructure and land features of critical importance to the county and the larger region. A remote method of tracking development in a community is to use the State of Maine’s E911 Addresses Feature. Developed to support emergency services, this database provides an authoritative, frequently updated record of addressable structures and other landmark locations for the entire state:

https://maine.hub.arcgis.com/datasets/c1de8b6877114e109980972b4250a883_0/about

Though this resource is authoritative, it has limited use for tracking changes in development over time due to variable improvements in record keeping over several years. Changes in development reported here are therefore assumed to be an upper limit estimate, where the true amount of development is likely to be less than reported. Use data from 2019 onwards is preferred because record keeping trends stabilize at that time. The earliest records of addressable structures in this database are from 2008.

According to this study, only a small percentage of development in Cumberland County has occurred in hazard-prone areas. As this table demonstrates, the total number of addressable structures in

Cumberland County has increased by 3.07% from January 2019 to September 2021. Of this increase in development, 25 (0.53%) of these new addressable structures are located in special flood hazard areas (SFHAs) and 130 (2.77%) of new addressable structures are located in hurricane evacuation zones (HEZs). There has been a net decrease of 5 addressable structures (-0.1%) located in both SFHAs and HEZs, suggesting that the small increase in development in SHFAs has occurred inland rather than along the coast where storm surge and tropical storm winds are more likely to occur.

Statewide measures are being taken in response to development in HEZs. The Maine Emergency Management Agency has recently published an online dashboard to help local residents identify if their home is located in a Hurricane Evacuation Zone, what evacuation routes are available to them, how to receive information on evacuation orders, and find other resources to help reduce their overall risk:

<https://storymaps.arcgis.com/stories/4fb502bf0ea6467693ff4191a1859e92>

The majority of participating jurisdictions did not see significant development (greater than two building sites) in special hazard zones that would impact the town’s overall vulnerability. However, those that did see development, or had more information to share on ordinances, provided further details in a survey, the results of which are reported in the following table:

Jurisdiction	Development in hazard-prone areas
Bridgton	solar farms but no hazard effects
Harpswell	Yes. We have had several expansions of marine related facilities and and lobster piers/docks. The owners are aware of the hazards. There have been some new residences and renovations but these conform to the Harpswell Floodplain Management Ordinance.
Scarborough	I am not aware of any new development project of 2 or more lots in the last 5 years that was located in a Special Flood Hazard Area. There have been several individual homes that have been replaced or have been substantially improved in compliance with our floodplain management ordinance requirements.
Cape Elizabeth	No, we have put the 100-year floodplain into a Resource Protection District so new construction is essentially not allowed.
Portland	Portland has floodplain and shoreland regulations, but no additional special hazard zones. Portland has a Floodplain Management ordinance, and it's consistent with FEMA floodplain management requirements. The ordinance regulates development but does not prohibit it, the ordinance prohibits certain things depending on the location and the use. The City does not have a record of every application that may have been under these regulations.
Baldwin	Yes. Several solar farms in rough territory of town.

Social Vulnerability

Social vulnerability is a measure of the ability of individuals, communities, and society as a whole to prepare and respond to hazardous events. The factors that make up social vulnerability include the strength of social networks and support systems in communities; socioeconomic factors such as poverty, housing, and access to transportation; and available support for functional and access needs like mental health resources, handicap accessibility, and language-appropriate resources. Understanding the social vulnerability of a community can be significant in resources allocation, estimating amount and type of supplies and staff needed, and in creating preparedness, response, and recovery plans.

In late 2020, CCEMA began work internally to define Cumberland County's social vulnerabilities with an eye on asking for 5 year projects that would mitigate damage to those communities.

To do this, CCEMA began, in January 2021, discussions with each municipality concerning their project intentions over the next several years and about mapping their areas of high hazard as they intersect with vulnerabilities. The primary goal is to provide some education and guidance on the issue of social vulnerability, how to define it, and how to apply the definition to hazard mitigation.

The FEMA BRIC program, with its focus on community resilience, provides a good background for this effort. As the FEMA website states, "The Building Resilient Infrastructure and Communities (BRIC) program aims to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience."

Use of the CDC Social Vulnerability Index (SVI) CDC. (2016). *CDC's Social Vulnerability Index (SVI)*. Centers for Disease Control and Prevention. [CDC SVI](#) and the Social Vulnerability Index (SoVI), developed by the Hazards and Vulnerability Research Institute at the University of South Carolina, to plot vulnerabilities by census tract and then overlaying that with hazard mapping by HAZUS will provide a macro understanding of possible mitigation needs. We will then add Climate Change Indicators from the U.S Global Climate Change Research Program to look for areas that might have increasing possibilities of mitigation needs.

Measures and Impact of Social Vulnerability

The CDC’s Social Vulnerability Index (SVI), based on the criteria in Figure 1, assigned Cumberland County, Maine at 0.1770 in 2016, where 0 is the lowest possible vulnerability and 1 is the highest possible vulnerability (CDC, 2016). Minority status and language present unique challenges in Cumberland County in providing language-appropriate resources, especially in the three cities (Portland, South Portland, and Westbrook). U.S. Census Bureau data from 2015-2019 found 120,644 households in Cumberland County speak a language other than English at home, which equates to 7.3% of the county’s population (U.S. Census Bureau, 2019). It is necessary for creation and adoption of language-appropriate resources, including weather advisories, preparedness activities, evacuation routes, shelter plans, and other hazard communications.

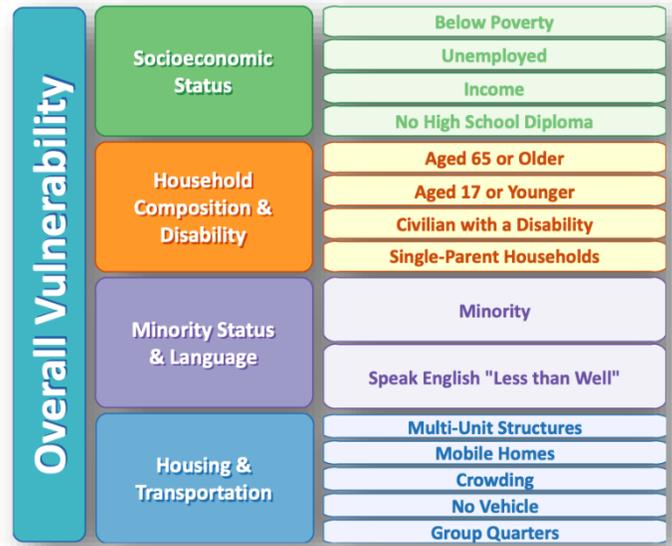
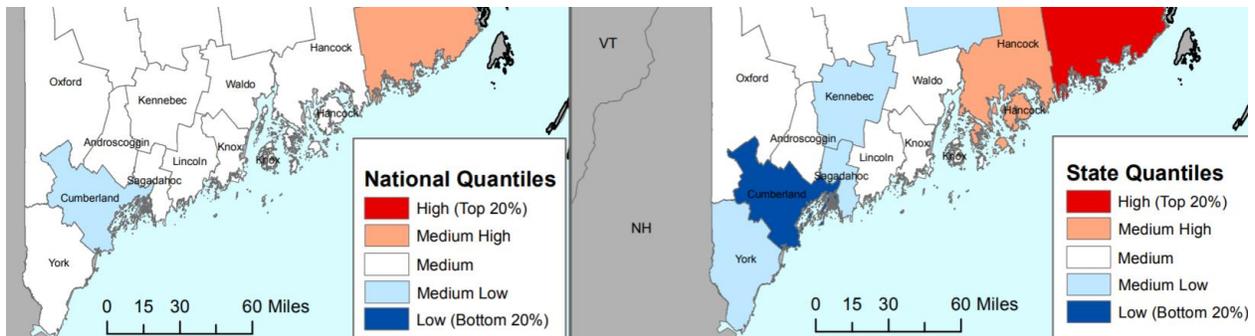


Figure 1: CDC’s Social Vulnerability Index (SVI) Criteria (CDC, 2020)

The University of South Carolina Social Vulnerability Index shows Cumberland County as in the medium low national quantile and the low state quantile. [U of SC Hazards and Vulnerability Research Institute](#)

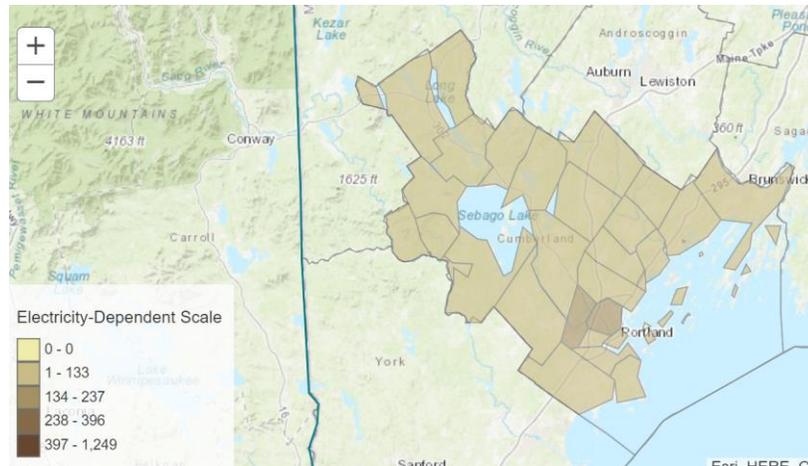


Another barrier to communication that presents social vulnerability is internet access. About 12.8% of households in Cumberland County do not have a broadband Internet subscription (U.S. Census Bureau, 2019), which limits the routes of information dissemination that can be accessed. Resources used by the county like CodeRed that disseminate disaster information by telephone are vital in reaching sections of the population that do not have access to the Internet or email.

Functional and Access Needs must be assessed by planners at the municipal and county level as well as by individuals and their caretakers. Disabilities and needs that pose a vulnerability include medical needs like durable medical equipment, oxygen supplies, and medications; barriers to communication like cognitive disorders or blindness; service animals; among others. Plans that promote continuity of

functional and access needs in times of disaster provide protection against this aspect of social vulnerability and increase the resilience of the county in responding to and recovering from disasters.

CCEMA uses the Centers for Medicare and Medicaid HHS eMPower Map to inform communities of the numbers of Medicare and Medicaid clients who are electrically dependent



[municipal eMPower map for Cumberland County](#)

The Plan describes the risk of floods in Cumberland county and the associated risk and impact. The Northeast States Emergency Consortium (NESEC) presents the social impact of displaced persons as a result of flooding and hurricanes. Vulnerability in crowded housing, income and poverty level, homelessness, and structural stability influence the resilience of households in response to floods. In times of flooding, 100 of 3,351 and 94 of 205 displaced people would require emergency sheltering (NESEC, 2020), which presents the need for shelter plans for displaced individuals, fluency in the National Flood Insurance Program, and support in recovery efforts for households that suffer structural damage. NESEC data on earthquakes in Cumberland County assess the extent of damage on critical infrastructure such as water and natural gas pipelines, communications utilities, electric power, highway roads and bridges, and other transportation facilities (NESEC, 2020). Any barriers to communication or transportation can exacerbate hazard impact. Strengthening infrastructure, as described in the Strategy Section of this plan, reduce the social vulnerability of the county.

Climate Change and Vulnerability

A 97% consensus among scientific associations (e.g., NASA, Intergovernmental Panel on Climate Change, American Association for the Advancement of Science, American Medical Association, etc.) has made it clear that climate change has begun and will continue to affect our environment and society. There are a variety of threats that climate change imposes on Maine, including ecosystem disruption, human health risks, altered precipitation patterns, and flooding (EPA, 2016). Especially concerning in the context of hazard mitigation is the risk of increased precipitation and changing precipitation patterns, increased floods and droughts, rising sea levels, loss of wetlands, and increased storm surge (EPA, 2016). Increases in flood risk and sea level, in combination with loss of wetlands and any existing infrastructure weaknesses, cause the county to be especially vulnerable to existing flood and erosion threats.

Recognition in this plan of the impact of climate change on weather patterns and the environment is the first step in mitigating these impacts, followed by assessment of the vulnerability of buildings, infrastructure, and critical facilities, and finally acting on plans to mitigate those vulnerabilities. The resilience of the county in the face of climate change will be determined by the planning capabilities at the municipal, county, and state level as well the ability to mitigate the social vulnerabilities of the county (e.g., planning to shelter people in the wake of a flood or hurricane or strengthening recovery efforts for low-income households). The National Oceanic and Atmospheric Administration (2014) recommends including a number of diverse stakeholders to effectively assess and combat risk and vulnerability, such as public utilities, local emergency managers, building engineers and regulation officials, and land conservation organizations. As can be seen in the Planning section of this plan, a number of these stakeholders have been engaged in regard to local hazards, vulnerability, and capabilities.

In 2021, CCEMA began to embark on multi-year project to inform communities about social vulnerability, to increase and understanding of the ramifications of not including this aspect into mitigation planning, and to encourage mapping of socially vulnerable populations, including but not limited to nursing homes and assisted living centers, low income housing, and child care programs. This should help municipalities to look at hazards that affect facilities like these and work to elevate community awareness and inclusive mitigation planning.

[Vulnerability to Infrastructure](#)

Please refer to Section 5 for further assessment and visualization of vulnerable infrastructure and mitigation projects that address these vulnerabilities.

Section 5: Mitigation Strategy

Requirement §201.6(c)(3)(i):	The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.
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County EMA strategy

The following table presents the mitigation goals and strategies for CCEMA planned to reduce vulnerability to the residents of the County. Many of the new goals have been added in response to the information received from the Public Participation Survey, the Local Capability Assessment, the Municipal Mitigation form results, and initiatives recently begun by CCEMA.

Because multiple towns requested assistance in developing Public Service educational materials, CCEMA has created a new table addressing those concerns. The resulting goals cover all aspects of mitigation, so all public information strategies are now included here rather than the specific hazard sections. As a result, goal numbers have been adjusted.

Goal #1: Provide Public Information Directly and through Municipalities

Public Education			
Action	Time Frame	Status	Responsible Party
1.1 Develop/Locate infographics for use of municipalities on their websites	Annually	New	CCEMA
1.2 Ensure new and existing materials are accessible to all ages, language proficiencies	Long Term	New	CCEMA
1.3 Provide information geared toward renters as well as homeowners	Long Term	New	CCEMA
1.4 Provide information to the public concerning the dangers specific hazards (flooding, wildfire, severe summer/winter storms, windstorms, landslides, climate changes) through brochures (such as those from the National Weather Service) posted on the county website and social media, (measured through “hits” and “engagements” on these sites) and distributed at public events	Annually & As Needed	Revised from 2017 plan	CCEMA
1.5 Use social media to encourage participation among diverse age groups	Annually	New	CCEMA

1.6 Review public service materials for accessibility for all educational levels and language proficiencies	Annually	New	CEEMA/ Interpreters
1.7 Develop webinars to inform town officials of the importance of mitigation planning and funding	Annually	New	CEEMA

Goal #2 Reduce damage, injury and loss of life resulting from flooding

Hazard: Flooding			
Action	Time Frame	Status	Responsible Party
2.1 Provide examples of best practices for building codes, zoning and land use for affected areas	As Needed	New	CEEMA
2.2 Review Emergency Action Plans for High and Significant Hazard dams on an annual basis and update contact information	Annually	Completed As Planned and Ongoing	CEEMA/LEMD
2.3 Provide Flood insurance Program updates to local EMA directors and town officials through local director meetings.	As needed	Ongoing	CEEMA
2.4 Promote community participation in NFIP's Community Rating System through local director meetings, emphasizing the difference between NFIP and CRS and emphasizing the benefits of CRS	Annually	Revised from 2017 Plan	CEEMA
2.5 Provide information to local directors and town officials about green infrastructure solutions to urban runoff/flooding through local director meetings and emails when grants are available	Annually	Revised from 2017 Plan	CEEMA
2.6 Promote river/stream corridor and wetland protection through education of local EMA directors and municipal officials.	Annually	Completed As Planned and Ongoing	CEEMA

Goal #3 Reduce damage, injury and loss of life resulting from severe summer and winter storms

Hazard: Severe Summer and Winter Storms			
Action	Time Frame	Status	Responsible Party
3.1 Support towns and eligible non-profits in applying for generator grants to protect their critical functions	Annually	Ongoing	CEEMA/LEMD
3.2 Use social media to inform public of impending storms/hazards	As needed	Revised from 2017 Plan	CEEMA
3.3 Track mitigation projects through surveys with local EMA directors/Public Works directors	Annually	Ongoing	CEEMA/LEMD
3.4 Support municipalities in development/maintenance of municipal shelter and warming/cooling center plans	Annually	Ongoing	CEEMA

Goal #4 Reduce damage, injury and loss of life resulting from coastal erosion

Hazard: Coastal Erosion			
Action	Timeframe	Status	Responsible Party
4.1 Update local emergency managers concerning storm surge mapping and relevant evacuation zones	Annually and As Needed	Ongoing	CEEMA
4.2 Inform local emergency management directors of grant availability for mitigation of vulnerable infrastructure	When Available	Ongoing	CEEMA
4.3 Work with local emergency managers and town officials to develop a tracking methodology for coastal erosion separately from other storm damages	Annually and As Needed	Deleted as municipal finance recording does not allow for breakdown	CEEMA/LEMD/TO

Goal #5 Reduce damage, injury and loss of life resulting from landslides

Hazard: Landslides			
Action	Timeframe	Status	Responsible Party
5.1 Provide information to local EMA directors and town officials of the dangers associated with the Presumpscot Formation clay deposits	Annually and As Needed	New	CEEMA/Maine Geological Survey
5.2 Provide examples of best practices for building codes, zoning and land use for affected areas	As Needed	New	CEEMA
5.3 Support BRIC applications for affected communities	As Needed	New	CEEMA

Goal #6: Reduce damage, injury and loss of life resulting from wildfires

Although CCEMA has not listed wildfire as a major hazard for this Plan, strategies in the table continue.

Hazard: Wildfires			
Action	Timeframe	Status	Responsible Party
6.1 Promote participation in wildfire prevention programs such as FireWise through local director meetings, monthly newsletter and community outreach	Annually	Ongoing	CCEMA/LEMD/TO
6.2 Promote participation in Maine Forest Service workshops and consultations through education of local directors and municipal officials through local director meetings and monthly newsletter.	Annually and As Needed	Ongoing	CCEMA/LEMD

Goal #7 Social Vulnerability Mapping

Social Vulnerability Activities			
Action	Timeframe	Status	Responsible Party
7.1 Develop a webinar for municipal officials on the importance of including social vulnerability in their mitigation planning.	Annually	New	CCEMA
7.2 Work with Local EMA Directors to map social vulnerability with the intent of directing mitigation toward those areas as needed.	Annually	New	CCEMA/LEMD

Goal 8 Integration of Municipal Planning and County Mitigation Plan

Integration of Local and County Mitigation Planning			
Action	Timeframe	Status	Responsible Party
8.1 Develop and use material for communication between local officials and CCEMA to facilitate information sharing cooperatively with municipalities	Annually	New	CCEMA, Local officials
8.2 Provide information to local EMA Directors concerning the importance of sharing development information in local hazard areas.	Quarterly	New	CCEMA
8.3 Continue to request that local EMA Directors work with town departments such as Planning Zoning and with Building Codes inspectors to develop strategy projects	Annually	New	CCEMA

Municipal Strategies

Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii):	The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.
Requirement §201.6(c)(3)(ii):	[The mitigation strategy] must also address the jurisdiction’s participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.
Requirement §201.6(c)(3)(iii):	[The mitigation strategy shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdictions. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.
Requirement §201.6(c)(3)(iv):	For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

Currently, all 28 communities within Cumberland County participate in the National Flood Insurance Program (NFIP). Their continued compliance with the program is encouraged at all levels of the County’s mitigation strategy. Two communities participate in the Community Rating System at Level Eight (Portland and Cape Elizabeth. Each community will continue to enforce its existing floodplain ordinance, thereby continuing to support NFIP compliance. Some participating jurisdictions provided additional information regarding continued NFIP compliance beyond floodplain ordinance enforcement:

Jurisdiction	Compliance Activity
Freeport	prepare and distribute NFIP insurance and building code explanations. participate in trainings, provide information through permitting process
Gray	Prepare and distribute NFIP insurance and building code explanations. We also inspect building foundations prior to framing to be sure the lowest floor is below the floodplain.
Bridgton	participated in trainings, provided information about development or reconstruction in flood zones
Harpwell	participated in trainings, CEO provides information to applicants, inspect foundations on new construction

<p>New Gloucester</p>	<p>.The flood hazard areas as currently mapped seem inaccurate but revisions currently being proposed by FEMA appear to fix these inaccuracies based on review of the draft maps. With the exception of roads, railroad tracks, and agricultural land there is little to no development within the flood hazard areas. No application has been submitted that has required review under the floodplain ordinance in at least the last 15 years. The town’s floodplain ordinance was adopted in 1992 and is in need of updating to meet current standards which the Land Management Planning Committee (LMPC) is looking at currently.</p>
<p>Scarborough</p>	<p>Yes we are in compliance. Aside from the preliminary FEMA remapping for Cumberland County, we now have a Certified Floodplain Manager on staff. We review, issue, and maintain all flood hazard development permits, Elevation certificates, letters of map amendment and other documentation as required by the NFIP. We respond to citizen's questions about flood risk, and we communicate public awareness of flood risk through our town newsletter and social media. We have our flood maps (both current and future) as layers on our town webGIS, which is available to the public through the Town website.</p>
<p>Sebago</p>	<p>Named our CEO as the coordinator, and he attends trainings as well as conducts inspections prior to framing.</p>
<p>Cape Elizabeth</p>	<p>Cape Elizabeth has joined NFIP; participated in NFIP training offered by the State and/or FEMA (or in other training) that addresses flood hazard planning management; revise/adopt subdivision regulations, erosion control regulations, board of health regulations, etc. to improve floodplain management in the community; participate in Community Rating System (CRS) or undertake activities it increase the grade level of the community's CRS current participation; prepare, distribute or make available NFIP, insurance and building codes explanatory pamphlets or booklets; inspect foundations at time of completion before framing to determine if lowest floor is at or above Base Flood Elevation (BFE); require use of elevation certificates; and enhance local official, builders, developers, local citizens and other stakeholders knowledge of how to read and interpret the FIRM.</p>
<p>Portland</p>	<p>Elevation Certificates: The Permitting and Inspections Department maintains elevation certificates for new and substantially improved buildings. Copies of elevation certificates are made available upon request. Map Information Service: The City of Portland provides and FEMA Flood Insurance Rate Map (FIRM) information to the community and has a website dedicated to FEMA FIRMs. Outreach - Information brochures are available at City Hall and the Library. Information is available on the City website. Flood Protection Information: Floodplain information displayed on the City's website. Open Space Preservation: Portland has preserved approximately 38 percent of the Special Flood Hazard Area (SFHA) as open space. Higher Regulatory Standards: The City of Portland enforces regulations that require freeboard for new and substantial improvement construction, and local drainage protection. The City of Portland enforces building codes, maintains a Building Code Effectiveness Grading Schedule (BCEGS) Classification of 3/3, and state mandated</p>

	<p>regulatory standards.</p> <p>Flood Data Maintenance: The City of Portland maintains and uses digitized maps in the day to day management of the floodplain</p> <p>Stormwater Management: The City of Portland enforces regulations for stormwater management, soil and erosion control, and water quality.</p>
Brunswick	<p>We have participated in numerous flood plan meetings during the review. We have reviewed the new flood maps and have spoken with numerous residents regarding any changes.</p>
Casco	<p>Yes, Code Enforcement, Shore Land Zoning, Planning Board training</p>
Yarmouth	<p>Review of plans to confirm we are in compliance. This is done on every development project</p>
Chebeague Island	<p>We recently established a mutual aid public works agreement with several Cumberland County communities.</p>
Raymond	<p>Zoning rules are based on flood maps.</p>
Naples	<p>Joined the NFIP.</p> <p>Participate in NFIP training offered by the State and/or FEMA that addresses flood hazard planning and management.</p> <p>Address NFIP monitoring and compliance activities.</p> <p>Adopted subdivision regulations, erosion control regulations, board of health regulations, etc. to improve floodplain management in the community.</p> <p>Require use of elevation certificates.</p> <p>Make available NFIP, insurance and building codes explanatory pamphlets or booklets.</p>
Windham	<p>We have changed and upsized where needed culverts and ditching, Staff has attended training and is waiting for the updated maps to be able to update associated zoning and ordinances.</p>

Baldwin	Established mutual aid agreements with neighboring towns.
Falmouth	NFIP training offered by State and/or FEMA

The list of local projects contained in the following table (and plotted in Figures 5-1 and 5-2) was developed and prioritized separately by each municipality. Projects were chosen based on local knowledge of the frequency and extent of local damages, the benefits resulting from hazard mitigation actions versus the cost of those actions, local knowledge of which projects were of the highest priority (based on frequency and severity of damages), local knowledge of weather, the geography and topography of the community, and the technical and financial abilities of their respective communities to address hazards and mitigate the impacts of hazards. Municipal capabilities could expand if other funding were to become available. For example, municipalities could use additional funding to address mitigation projects identified in this plan, strengthen new or pre-existing zoning ordinances, policies, and programs addressing mitigation of hazards profiles in the Plan, or prepare cost benefit analyses in order to assess the projects that best qualify for FEMA mitigation program funding. Prioritization can also be independently verified based on spatial analyses shown in Figures 5-1 and 5-2, in which mitigation projects with available coordinate data overlay zones that are susceptible to multiple hazards (flood, storm, sea level rise).

Many of the municipalities in Cumberland County are small towns that do not have the resources, staff or funding to prepare cost benefit analyses for their proposed projects. However, in virtually all cases involving expenditure of local funds for implementation, there will be a very rigorous, line-by-line analysis of cost effectiveness during the budget review process and subsequent public discussion through regular and special meetings. This review is at least equal to a formal benefit-cost calculation because each expenditure item will be scrutinized rather than simply plugged into a formula. Furthermore, MEMA and CCEMA have made it clear to local officials that a formal cost-benefit analysis must be prepared when they apply for mitigation funding.

The list of projects contained in the table below is largely the result of Cumberland County EMA’s collaboration with town officials, local EMA, and Public Works officials to first review and update their hazard mitigation project lists, and secondly, to continue their ongoing efforts to map specific locations that require mitigation. The table includes project data relevant to its identification/location, its prioritization, its cost, the timeframe estimated to complete, and the responsible agency. The timeframe includes the estimated completion period that starts when funding is available and permitting has been obtained. Short term is 1 year, midterm is 2-3 years, and long term is 4-5 years before completion.

All municipalities understand that placing projects in the plan is no guarantee of their eligibility for grants or of federal funding. It should also be noted that in many instances, capabilities could expand if additional funding were to become available.

It should also be noted that many urgently needed projects are not included here as they are on State roads and the towns do not have authority to do needed upgrades. In some instances, lengthy permitting processes are holding up needed work.

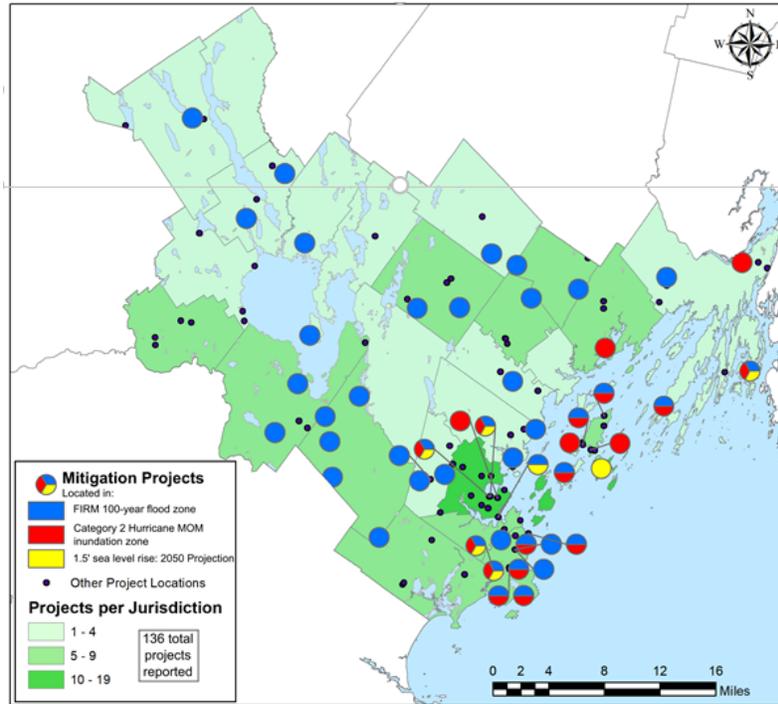


Figure 5-1: Map of Cumberland county symbolizing the total number of reported mitigation projects in each jurisdiction, locations of projects with available coordinate data, and potential vulnerability to known hazards (flood, hurricane/coastal storm, sea level rise) based on location in hazard zones. The amount of sea level rise projected in this model (1.5 feet by 2050) was determined by the scientific and technical subcommittee of the Maine Climate Council and included in Maine LD 1572: “Resolve, To Analyze the Impact of Sea Level Rise” (www.billtrack50.com/BillDetail/1367928). Sources: Maine office of GIS, Cumberland County Jurisdictions, NOAA SLOSH model, NFIP digital FIRM panels, National Hydrography Dataset.

Map courtesy of Samuel Roy, State Hazard Mitigation Planner

In the following projects list, completed projects move to the bottom of the list and are shaded in gray, and newer projects are re-prioritized. References to culverts on the following pages refer to upsizing or lengthening culverts, unless otherwise stated. According to Culvert Sizing Design Guidance approved by the Maine Department of Transportation Environmental Office in 2015 (available online: <https://www.maine.gov/mdot/edi/docs/CulvertSizing52115.pdf>), upsizing and lengthening culverts is an important mitigation practice to improve flow conditions and reduce the extent and likelihood of flood damage caused by undersized or poorly designed/maintained culverts. Similarly, projects that reference ditching and elevating roads are intended to avoid road surface flooding and associated transportation and emergency response vulnerabilities.

Unless otherwise noted in the table, projects are funded by municipal operations budgets or capital improvement budgets.

CCEMA regularly provides information to municipalities on grant application openings for such grants as the FEMA Hazard Mitigation Assistance (HMA) grant funds (www.maine.gov/mema/grants/mitigation-grants), Maine Department of Environmental Protection’s Culvert/Stream Crossing grants, the Maine

Small Harbor Improvement Program, MainedOT local road assistance funds (www.maine.gov/mdot/csd/lrap/), or other opportunities as we discover them.

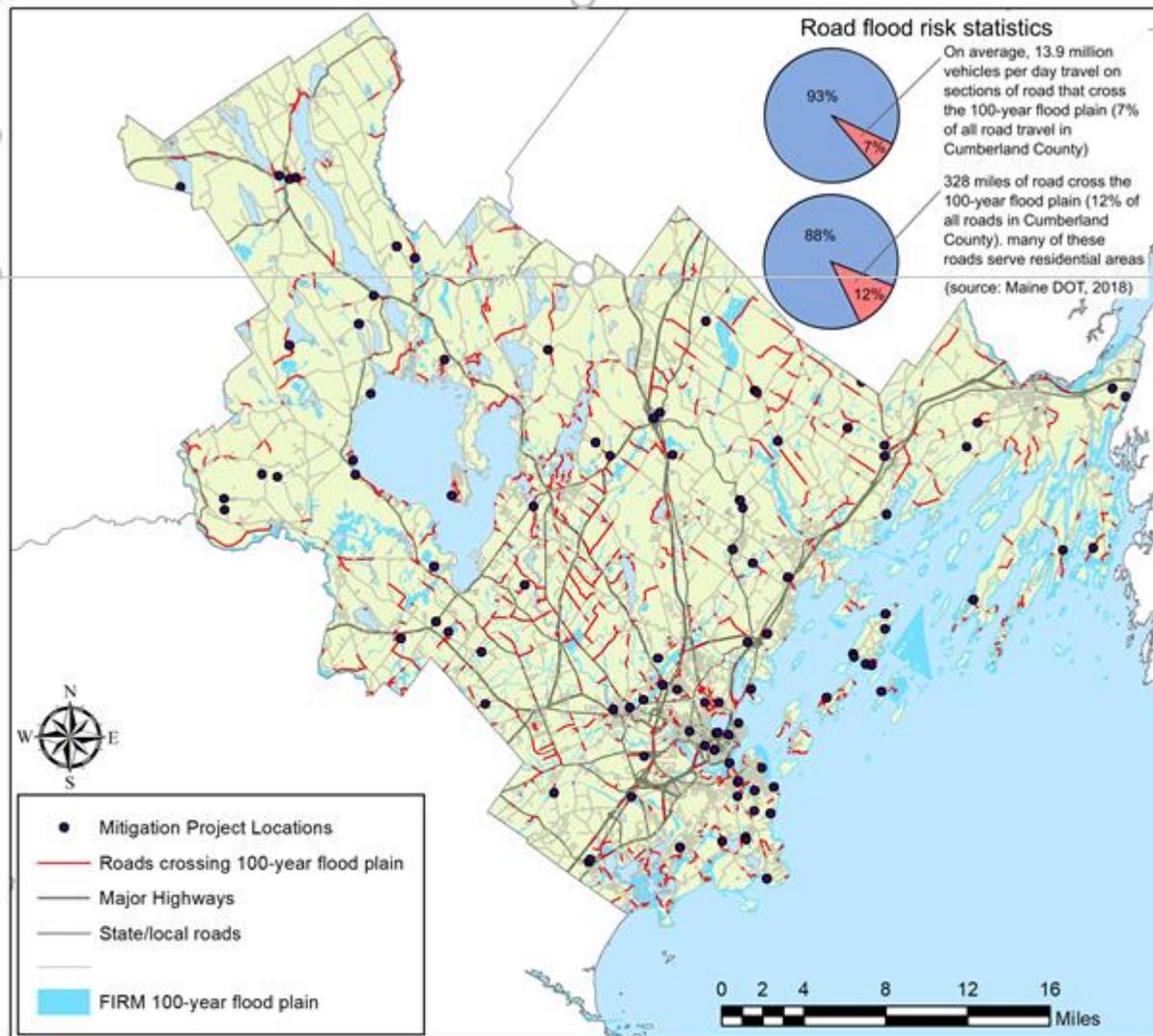


Figure 5-2: Map of Cumberland county symbolizing the location of mitigation projects and locations where road segments intersect the FIRM 100-year flood plain, indicating potential roadway flood hazards and mitigation projects that reduce community vulnerability to potential hazards. Many of the potentially vulnerable roads serve residential areas with few alternative routes. Sources: Maine office of GIS, Maine DOT Public Roads Database (https://hub.arcgis.com/datasets/1a3a6436cc054eb3947d8cb36b039daa_52/explore), Cumberland County jurisdictions, National Hydrography Dataset, NFIP FIRM panels.

Map courtesy of Samuel Roy, State Hazard Mitigation Planner

	Project	Problem Statement	Lat/Long	Est. Cost	Time frame	Responsible Official	Status	Point of Contact and email
Projects shaded in gray are completed. Many towns opted to continue to use projects they've been unable to fund since the 2017 Plan, as these remain high priority.								
Baldwin	1) Update several building codes in reflection to drainage issues throughout town.	Due to the hilly and rough terrain, new construction in town should be covered by building codes.	N/A	None	Mid-term	Fire Chief, Code Enforcement, EMA Director	New Project	owensprague3498@yahoo.com
	2) Monitor Senator Black Road near campground for erosion issues	The new campground will bring extra traffic to this road. The Road Commissioner will monitor for conditions that will affect the roadway and culverts	43.49.29 / -70.45.16	None	Long-term	Road Commissioner	New Project	owensprague3498@yahoo.com
	3) Wentworth Rd: paving, culverts, ditching, shoulder work, reclaim, rip-rap, cut trees	Road vulnerable to washing during heavy rain events. Road did not have any ditching along the road, some culverts were in the wrong spots, and some of the culverts were completely rotten. trees and stumps need to be removed for ditch work	43.841135 / -70.703157	\$175K	Long Term	Road Commissioner	Complete	Brian Anderson - Road Commissioner 207-727-0027 email: baldwinroads@gmail.com Owen Sprague (EMA): owensprague3498@yahoo.com
	4) Senator Black Rd: culverts, ditching, shoulder work, reclaim, rip-rap, cut trees	Road vulnerable to washing during heavy rain events. This road kept washing out during heavy rain events because there wasn't any ditching along the road, some culverts were in the wrong spots, and some of the culverts were completely rotten.	43.816799 / -70.754041	\$600K	Long Term	Road Commissioner	Complete	Brian Anderson - Road Commissioner 207-727-0027 email: baldwinroads@gmail.com Owen Sprague (EMA): owensprague3498@yahoo.com
	5) Saddleback West Rd.; Remove trees from ditch line 3,500' add ditch 650' add 24" x 40' cross culvert.	The road has no ditching and the road kept washing out during heavy rains events.	43.842856 / -70.717949	\$9K	Long Term	Road Commissioner	Complete	Brian Anderson - Road Commissioner 207-727-0027 email: baldwinroads@gmail.com Owen Sprague (EMA): owensprague3498@yahoo.com

Bridgton	1)Smith Avenue new culvert system, roadside curbing and repaving	During heavy rain or spring run-off, water runs onto the roadway, side of road requires constant attention. During the winter months, sheets of ice buildup on the roadway causing constant sand and salt treatments to avoid large buildups of ice on the road. A small river at the bottom of it undoubtedly receives some of the run-off of sand and salt from winter-time treatments and should be mitigated also.	44.03.08/ - 70.41.49	\$25K	Mid-term	Road Commissioner	New Project	Todd Perreault ema@bridgtonmaine.org
	2) Oak Street Install 2 catch basins, underdrainage, curbing and re-pavement	It has some of the same issues as Smith Ave but on a lesser impact and grade. The run-off is still a concern, has the same small river at the bottom of the road and should be mitigated also.	44.03.12/ - 70.41.27	\$60K	Mid-term	Road Commissioner	New Project	Todd Perreault ema@bridgtonmaine.org
	3) Mountain Road improve ditching, new culvert system, paving	Water run-off from the mountain during heavy rain or spring run-off of melting snow, overwhelms the water run-off capacity of the ditching and culvert system that is currently in use. Road closure would require one to travel 13.5 miles around to get to the other side of the affected area. Emergency services would see a delay in response and would require mutual aid from the abutting town if this road were to completely wash out.	44.02.02/ - 70.48.02	\$35K	Mid-term	Road Commissioner	New Project	Todd Perreault ema@bridgtonmaine.org

	4) Post Office Square (Main St-Depot St.); Upsize existing 48" x 50' culvert with 4' x 10' x 50' bottomless box culvert to match culvert under US 302. Revised: needs study and permitting from DEP, EPA, NFIP and USACE	During heavy rain events the existing culvert cannot handle the amount of water resulting in flooding out our Main Street Businesses.	44.03.15/ 70.42.27-	UNK	Long Term	Road Commissioner Engineering Firm	Revised from 2012 Plan – crosswalk adjustments and road resurfacing postpones this work for at least 5 years	Todd Perreault ema@bridgtonmaine.org
Brunswick	1) Bath Road replace underperforming culvert with one of adequate size	This is an inadequately sized and underperforming culvert on Bath Road that leads to poor draining of the associated upper ponds. The restricted size effectively dams the water and has caused flooding issues with an adjacent property owner.	43.9130271 22242006/ - 69.8879660 6220397	\$350K	Long term	Director of Public Works	New Project	Jay Astle Public Works Director jastle@brunswickme.org or Ryan Barnes Town Engineer rbarnes@brunswickme.org
	2) Pleasant Hill Rd; Upsize twin 5' x 66' culverts w/ 12' x 6' x 70' bottomless box culvert w/ integrated headwalls.	During heavy rain events the roadway is overtopped and washouts occur adjacent to the inlet and outlet.	43.8876/ - 70.0197	\$175- 200K	Long Term	Director of Public Works	Deferred, Lack of Funding	Jay Astle Public Works Director jastle@brunswickme.org or Ryan Barnes Town Engineer rbarnes@brunswickme.org
	3) Highland Rd. Upsize existing 24" x 40' culvert with 36" x40' N-12 culvert and riprap inlet and outlet.	During heavy rain events the roadway is overtopped.	43.8703/ - 70.0300	\$25K	Long Term	Director of Public Works	Deferred, Lack of Funding	Jay Astle Public Works Director jastle@brunswickme.org or Ryan Barnes Town Engineer rbarnes@brunswickme.org
	4) Bull Rock Rd; Ditch and armor 400' add (2) 15" x 40' N-12 driveway culverts & an 18" x 40' N-12 cross culvert riprap inlet and outlet	During heavy rain events the existing ditch and culverts are overwhelmed and the resulting scour velocities result in existing driveways and portions of the roadway washing out	43.9073/ -69.8752	\$12K	Long Term	Director of Public Works	Deferred, Lack of Funding	Jay Astle Public Works Director jastle@brunswickme.org or Ryan Barnes Town Engineer rbarnes@brunswickme.org

Cape Elizabeth	1) Kettle Cove Rd. @ Crescent Beach; Rebuild road substructure/retaining wall that abuts Crescent Beach	A portion of the seawall is compromised. A major portion of the seawall is failing on the westerly side of the road adjacent to the beach. The wall was partially rebuilt in the early 1970's but no further action has been taken to stabilize the remaining section of wall since that time.	43.562795 / - 70.219004	\$500K	Long Term	Director of Public Works	Deferred, Lack of Funding	Jay Reynolds, Public Works Director: jay.reynolds@capeelizabeth.org
	2) Garden Circle. Improve gravity storm drain outfall and/or install storm-water pump station	Flooding in cul-de-sac during above-average storm events. The outlet pipe from the existing catch basin is undersized and underwater during mean high tide situations. A feasibility study was done in 2010 that provided remediation options for the town to consider.	43.627444 / - 70.213879	\$125K - \$1.1M	Mid term	Director of Public Works	Deferred, Lack of Funding	Jay Reynolds, Public Works Director: jay.reynolds@capeelizabeth.org
	3) Hemlock Hill & Oakhurst Road - Drainage Improvements	Lack of appropriate upstream and downstream storm-water infrastructure. Action taken to date: Phase 1 of a two-phase drainage improvements completed on Hemlock Hill Road in November 2019. A conceptual design has been done for Phase 2 but the project has not been programmed yet.	43.625022 - 70.232474	\$60K	Short term	Director of Public Works	Deferred, Lack of Funding	Jay Reynolds, Public Works Director: jay.reynolds@capeelizabeth.org

<p>4) Sawyer St.@ Spurwink River: Elevate 600' x 22' x 18" add (3) 18" x 40' N-12 cross culverts, stabilize shoulders and repave</p> <p>2019 changed to: Sawyer Road @ Spurwink River - Roadway & Drainage Improvements</p>	<p>Existing culvert is slightly compromised (hole in top of it). The roadway easterly of culvert floods during astronomical high tides and when extreme weather events coincide with high tide conditions. Assessment of conditions was done as part a town-wide culvert assessment study in 2018. Additional grant was obtained to undertake a potential sea level rise feasibility study of remedial options for both towns to consider.</p>	<p>43.588642/ -70.262843</p>	<p>\$200K 2019 \$1M+</p>	<p>Long Term</p>	<p>Director of Public Works: Joint Project with Scarborough</p> <p>Towns of Cape Elizabeth & Scarborough, Inland Fish & Wildlife & Misc. Stakeholders</p>	<p>1st phase complete</p>	<p>Jay Reynolds, Public Works Director: jay.reynolds@capeelizabeth.org</p>
<p>5) Willow Brook Stream Crossing @ Portland Water District X-Country Sanitary Sewer Line - Culvert Replacement</p>	<p>Existing culvert is slightly compromised (hole in top of it). The roadway easterly of culvert floods during astronomical high tides and when extreme weather events coincide with high tide conditions.</p>	<p>43.591717/ -70.240061</p>	<p>\$1M+</p>	<p>Long Term</p>	<p>Director of Public Works</p>	<p>1st phase complete d</p>	<p>Jay Reynolds, Public Works Director: jay.reynolds@capeelizabeth.org</p>
<p>6) Willow Brook Stream Crossing @ Portland Water District X-Country Sanitary Sewer Line - Culvert Replacement</p>	<p>Twin 54" CMP culverts last replaced in 1984 have failed. A large diameter gravity sanitary interceptor sewer and a large diameter pressurized sanitary sewer line go over the culverts.</p>	<p>43.610579/ - 70.232287</p>	<p>\$320K</p>	<p>Short Term</p>	<p>Director of Public Works</p>	<p>New Project 2019</p>	<p>Jay Reynolds, Public Works Director: jay.reynolds@capeelizabeth.org</p>
<p>7) Mitchell Road @ Pond Cove Brook - Culvert Replacement</p>	<p>Potential culvert failure. Culvert is a 48" CMP-type and last replaced in 1975. The invert of the pipe is corroding and deteriorating. Culvert is adjacent to a sanitary pumping station. Both a gravity and pressurized sanitary sewer line are above the culvert.</p>	<p>43.610579/ -70.232287</p>	<p>\$365K</p>	<p>?</p>	<p>Director of Public Works</p>	<p>New Project 2019</p>	<p>Jay Reynolds, Public Works Director: jay.reynolds@capeelizabeth.org</p>

	8) Shore Road @ Pond Cove – Roadway & Drainage Improvements	The proximity of the three cross-culverts (3-36" aluminized Type II) to the ocean lends them to be clogged with rock and debris during severe coastal storms which restrict the culverts flow.	43.609126/-70.216344	\$1M+	Long term	Director of Public Works	New Project 2019	Jay Reynolds, Public Works Director: jay.reynolds@capeelizabeth.org
	9) Ocean House Road @ Trout Brook Culvert Replacement	This is part of a long term project to manage the watershed and improve water quality	43.620571/-70.2484207	\$375K	Long Term	Director of Public Works	New Project 2019	Jay Reynolds, Public Works Director: jay.reynolds@capeelizabeth.org
Casco	1) Work with Town Officials to adopt MUBEC building codes	The State of Maine requires that all municipalities of 4,000+ must have building codes. The town must adopt either the Maine Uniform Building Codes or a version of the IBC/IRC and implement the change.	N/A	None	Mid Term	Town Officials, Planning and Code Enforcement	New Project	manager@cascomaine.org
	2) Point Sebago Rd. Site #1; Add 24" x 40' N-12 cross culvert, ditch and line 200' and repave	No problem statement provided	43.55.35-70.32.31	\$4K	Mid term	Road Commissioner	Deferred - Lack of Funding	EMA Director Steve Merkle smerkle@cascomaine.org
	3) Leach Rd; Upsize existing cross culvert with 6'x 4' x 40' box culvert.	No problem statement provided	None provided	\$35K	Long Term	Road Commissioner	Deferred - Lack of Funding	EMA Director Steve Merkle smerkle@cascomaine.org
	4) Johnson Hill Rd; Ditch and line 2,000', install check dams and upsize (4) 15" x 24' culverts w/ (4) 18" x 32' N-12 culverts. Road reconstruction scheduled	No problem statement provided	None provided	\$23K	Short Term	Road Commissioner	Deferred - Lack of Funding	EMA Director Steve Merkle smerkle@cascomaine.org

Chebeague Island	1) Stone Wharf. Replace or relocate Chebeague island Ferry landing. Vulnerability Study complete; Engineering Study ongoing. The town intends to have a design-level assessment done on the Stone Wharf within the coming (21/22) year.	Seal Level Rise Vulnerability study identifies the sites being at risk of inundation. Minor inundation of wharf head and parking areas has occurred in recent years. When the Stone Wharf floods in storm events transportation to and from the island is halted. This includes ambulatory transportation.	43.751203°7 0.107397°	\$300K - \$1M	Long Term	Town Manager Road Commissioner Select Board	New Project	Justin Poiriertownadmin@townofchebeagueisland.org
	2) Indian Point Road planning process of limiting access to the most vulnerable sections of the Indian Point Rd to vehicles	Storm damage and the effects of sea-level rise and erosion can occur without the need for future repairs.	43.43.22/ -70.08.17	None	Mid term	Town Manager	New	Justin Poirier townadmin@townofchebeagueisland.org
	3) Bennett Cove. Engineering Study for improvements to stone block commercial boat ramp	No problem statement provided	43.42.57 -70.07.33	UNK	Long Term	Town Manager Road Commissioner Select Board	New Project	Justin Poirier townadmin@townofchebeagueisland.org
	4) Indian Point Rd; Install sheet pile 500' x 10'.	Seal Level Rise Vulnerability study identifies the site as being at risk of inundation.	43.720790° 70.137142°	\$14K	Mid term	Town Manager Road Commissioner	Deferred - Lack of Funding	Justin Poirier townadmin@townofchebeagueisland.org
	5) South Road where Secret road intersects.	During heavy rain events water sheets over paving and saturates the road bed	43.740815°, -70.107536°	UNK	Mid term	Town Manager Road Commissioner	New Project	Justin Poirier townadmin@townofchebeagueisland.org
	6) South Shore Drive	Seal Level Rise Vulnerability study identifies the site as being at risk of inundation.	43.715122°/ -70.119788°	UNK	Long Term	Town Manager Road Commissioner Board	New Project	Justin Poirier townadmin@townofchebeagueisland.org

Cumberland	1)Public safety radio communications tower installation	Two-way radio system is not integral with Cumberland County Regional Communications Center. The topography of the town is presently not commensurate with continuous radio signal strength to the public safety dispatch for police, fire and EMS.	43.795577/ - 70.257242	\$240K	Short Term	Charles Rumsey, Chief of Police crumsey@cumberlandmaine.com	New Project	Charles Rumsey, Chief of Police crumsey@cumberlandmaine.com
	2) Tuttle Rd Site 2; Elevate 200' x 21' x 3' stabilize shoulders and repave. Engineering Study completed	Flooding condition due to limited size of culverts and height of road.	43.785882, - 70.237574	\$18K	Long Term	Director of Public Works	Deferred - Lack of Funding	Daniel Small dsmall@cumberlandmaine.com
	3) Middle Rd @ Hazeltines; Upsize existing 36" x 50' lined culvert with 42" x 50' N-12 culvert and riprap inlet and outlet.	Flooding condition due to limited size of culverts and height of road.	43.776259/ -70.202954	\$17K	Long Term	Director of Public Works	Deferred - Lack of Funding	Daniel Small dsmall@cumberlandmaine.com
Falmouth	1) Northbrook Drive; Upsize existing 48" culvert with 8' x 4' x 80' bottomless box culvert and riprap inlet and outlet.	Under sized culvert that have corrosion issues. Steep side slopes causing sloughing issues with sidewalk and roadway.	43.736224/ - 70.222390	\$200K+	Long Term	Director of Public Works	Deferred – Lack of Funding	Jeff Buxton jbuxton@falmouthme.org
	2) Middle Rd. @ Scittery Gussett Brook; Upsize triple 15" culverts with bottomless box culvert or as required by H&H study and riprap inlet and outlet.	Culverts have corrosion issues and are prone to clogging causing roadway flooding. Needs easement rights	43.730015/ - 70.241470	\$100K	Long Term	Director of Pulic Works	Revised from 2012 Plan - held up for ACoE permit	Jeff Buxton jbuxton@falmouthme.org
	3) Shoreline Drive Coastal Erosion; Stabilize bank 100' x 50' x 3' with large fractured stone Engineering study complete	Erosion and sloughing issues along shoreline.	43.696553/ - 70.237252	\$75K	Long Term	Director of Public Works	Study - Town funds Deferred – Lack of Funding	Jeff Buxton jbuxton@falmouthme.org

Freeport	1) Monitoring of recent mitigation project at Percy Street to evaluate previous projects	Culvert upgrade completed, now need to monitor for effectiveness	43.41.47/ -70.06.37	None	Long Term	Director of Public Works	New Project	cjordan@freeportmaine.com
	2) Hunter Road. Upsize existing culvert with 24" culvert	No problem statement provided		\$125K	Mid term	Director of Public Works	New Project	cjordan@freeportmaine.com
	3 Percy Street. Upsize existing culvert with 24" culvert	Minor Flooding of the Street and Surrounding Land	43°51'47"/ -70°06'37"	\$10K	Mid term	Director of Public Works	New Project	cjordan@freeportmaine.com
	4) Richards Lane; Elevate 150' x 1' x 22' stabilize shoulders upsize twin 15" x 40' culverts with 6' x 3' x 40' bottomless box and riprap inlet and outlet	No problem statement provided	43.52.14 -70.06.37	UNK	Long Term	Director of Public Works	Deferred - Lack of Funding	cjordan@freeportmaine.com
Freeport	1) move dry pit pump above ground and raise structure at least three feet.	No problem statement provided	43°49'19.16 -70°6'24.96"	\$300K	Long Term	Board of Directors	New Project	N/A
Frye Island	1) Monitor/ mitigate hillside erosion in Recreation Area trail between Beach 10 and Long Beach. Site monitoring will continue in order to collect more information and determine the best approach to mitigating the hazard.	Several areas of the trail are eroding in heavy rainstorms allowing sediment to be washed into the lake	43.49.49 -70.31.56	UNK	Long Term	Director of Public Works	Retained	bill.braun@fryeislandtown.org
Gorham	1) Wood Rd; Upsize existing multiple culverts with 12' x 6 x 40' bottomless box culvert and riprap inlet and outlets.	Upsizing pipe, road floods and erodes when we receive more than a total of a 1.5" inch of rain or a large amount in a short period of time.	43' 40' 59/ - 70 29' 45	\$80K	Long Term	Director of Public Works	Deferred - Lack of Funding	rburns@gorham.me.us

2 Wilson Rd: Upsize existing culvert with 10' x 5 x 40' bottomless box culvert and riprap inlet and outlets.	Upsizing pipe, road floods and erodes when we receive more than a total of a 1.5" inch of rain or a large amount in a short period of time.	43. 46' 4/ - 70 27' 34	\$60K	Long Term	Director of Public Works	Deferred - Lack of Funding	rburns@gorham.me.us
3) Buck St; Upsize existing multiple culverts with 20'x 8' x 40' bottomless box culvert and riprap inlet and outlets. Elevate road 200' x 21' x 3' and repave.	Upsizing pipe, road floods and erodes when we receive more than a total of a 1.5" inch of rain or a large amount in a short period of time.	43 43' 12/ - 70 30' 2	\$130K	Long Term	Director of Public Works	Deferred - Lack of funding	rburns@gorham.me.us
6) New Portland Rd; Upsize existing multiple culverts with 10' x 5' x 40' bottomless box culvert and riprap inlet and outlets.	large, medium, and small rivers and streams have the potential for flooding due to more frequent storms events affecting homes and Town infrastructure	None given	\$60K	Long Term	Director of Public Works	Remove - Lack of Funding	rburns@gorham.me.us
4) Mitchell Hill Rd; Elevate road 300' x 3' x 22' stabilize shoulders and upsize existing culvert with bridge approx. 100' x 22' with wing walls.	No problem statement provided	None given	\$600K	Long Term	Director of Public Works; Joint project with Scarborough	Remove	kfickett@gorham.me.us
5) Dingley Springs Rd.; Upsize existing multiple culverts with 12' x 6 x 40' bottomless box culvert and riprap inlet and outlets.	No problem statement provided	None given	\$80K	Long Term	Director of Public Works	Remove	kfickett@gorham.me.us

Gray	1) Connect the water supply for Gray to either Portland Water District or Yarmouth District. 1) Connection to Yarmouth Water District 2) Connect to Portland Water District	The well head for the public water supply is bisected by the Maine Turnpike and Route 26. This presents the very real risk of water contamination from a HazMat incident along these roads.	1) 43.515720 - 70.164447 2) 43.493175 - 70.185930	\$1.5 - \$2.8 million	Long Term	Gray Water District	Deferred - Lack of funding	w.gardner@graywaterdistrict.org
	2 Campbell Shores Rd Site #1; Upsize triple 24" x 40' culvert with 4' x 8' x 40' bottomless box culvert raise road 21' x 3' x 500' and repave	Upsizing pipe, road floods and erodes when we receive more than a total of a 1.5" inch of rain or a large amount in a short period of time.	43.86972 - 70.39250	\$60K	Long Term	Director of Public Works	Deferred - Lack of Funding	Alec Dodd - adodd@graymaine.org
	3) Campbell Shores Rd Site #2; ;Upsize triple 24" x 40' culvert with 4' x 8' x 40' bottomless box culvert raise road 21' x 3' x 500' and repave.	Upsizing pipe, road floods and erodes when we receive more than a total of a 1.5" inch of rain or a large amount in a short period of time.	43.860512 - 70.378255	\$60K	Long Term	Director of Public Works	Deferred - Lack of Funding	adodd@graymaine.org
	4) Long Hill Rd.; Upsize 60" x 40' culvert with 5' x 8' x 40' bottomless box culvert, raise road 21' x 6' x 500' stabilize shoulders and repave.	Upsizing pipe, road floods and erodes when we receive more than a total of a 1.5" inch of rain or a large amount in a short period of time.	43.861862 - 70.317402	\$70K	Long Term	Director of Public Works	Deferred - Lack of Funding	adodd@graymaine.org
Harpwell	1) Basin Point Rd. preliminary design/engineering study (\$20,000 from State's Coastal Communities grant for sea level rise)	Assess need to raise road Ongoing research study of Basin Point Road and sea level rise, very low lying road section, Phase 1 started 2017 with report in 2020, Phase 2 upcoming in 2021/22 to determine options and decide on road change/enhancement. Cost to be determined once level of road enhancement determined.	43.762379/ - 70.021742	\$20K initial engineering/design work 2017-2020	Long Term	Town Planner	New Project	Mark Eyerman, planner@town.harpwell.me.us

	2) Long Point Rd. Shore up embankment; engineering study done 2013	No problem statement provided	43.798214 -69.934610	\$75K	Mid term	Road Commissioner	Complete	ahowe@town.harpswell.me.us
	3) Bethel Point Rd. Replace existing 8' X 40' culvert with same sized culvert	No problem statement provided	43°48'00.9" -69°54'18.7"	\$4.15M	2mon	Road Commisioner	Complete	ahowe@town.harpswell.me.us
Harrison	1) Conduct a public education campaign on the current hazards and flood possibilities	Community members, especially those moving into the area, may not be familiar with the hazards posed in Harrison.	N/A	UNK	Long Term	EMA Director and town officials	New Project	Ray LaPlante fire7@roadrunner.com
	2) Buck Rd; Remove ledge in ditch line 300', continue berm along road and upsize existing twin culverts with 36" x 40' N-12 culvert.	Significant rain events exceeding 1" and rapid spring snow melt events overwhelm the culverts resulting in road erosion.	GPS coordinates unavailable due to no cellphone coverage	\$9K	Mid term	Road Commissioner	Deferred – Lack of Funding	Ray LaPlante fire7@roadrunner.com
	3) Fog Rd.; Upsize existing twin 36" x 40' cross culvert with 8' x 4' x 40' box culvert riprap inlet and outlet	Significant rain events exceeding 1" and rapid spring snow melt events overwhelm the culverts resulting in road erosion.	GPS coordinates unavailable due to no cellphone coverage	\$9K	Long Term	Road Commissioner	Deferred – Lack of Funding	Ray LaPlante fire7@roadrunner.com
	4) Summit Hill Rd. Remove ledge, ditch, and replace culverts on the unpaved section of the hill.	The road is very narrow which has hindered attempts to mitigate the problem areas. Major washout of the area after winter snow melt or very heavy rains. The distance is 1.5miles	GPS coordinates unavailable due to no cellphone coverage	\$500K		Road Commissioner	New Project 2019	Ray LaPlante fire7@roadrunner.com
Long Island	1) Front Beach Erosion	working with a collective group of property owners on Front Beach to deal with the erosion and hazards presented by trees bringing down the existing banking. The Planning Board, in conjunction with the Maine DEP, is considering changes	None given	UNK	Long Term	Planning Board	New Project	townadmin@longislandmaine.org

		regarding tree removal and replacement plantings.						
	2) Wave breaks on east side of Mariners' Wharf	installation and repair of existing wave break around the East side of Mariners Wharf where the public ferry lands. Increasing storm activity and their severity are damaging the floats and vessels using that facility.	43.41.30 -70.09.48	\$434K	Mid Term	Town officials	New Project	townadmin@longislandmaine.org
	1) 765 Island Ave; Engineering Study and upgrade culvert and stabilize outlet with riprap.	working with a collective group of property owners on Front Beach to deal with the erosion and hazards presented by trees bringing down the existing banking. The Planning Board, in conjunction with the Maine Department of Environmental Protection, is considering changes regarding tree removal and replacement plantings.	None given	\$100K	Long Term	Road Commissioner	Complete	townadmin@longislandmaine.org
	2) Island Ave. & Garfield St; Install catch basin, add 18" x 40' N-12 culvert and upsize 15" x 40' culvert with 18" x 40' N-12 culvert. Ditch and armor 700' and shim 800' of road. Rebuild drainage grate	No problem statement provided	None given	\$12K	Long Term	Road Commissioner	Complete	townadmin@longislandmaine.org
Naples	1) Lakehouse Road near Muddy River ditching	Roadway that will wash out in heavy rain	43°57'02.8" -70°37'36.1"	\$3.5K	Mid term	Road Commissioner	New Project	Ephrem Parashak - Captain - FD - paraschak@townofnaples.org
	2) Lamb's Mill Road from Rt 302 to hilltop ditching	Roadway that will wash out in heavy rain	43°58'14.4" -70°36'45.3"	\$3.5K	Mid term	Road Commissioner	New Project	Ephrem Parashak - Captain - FD - paraschak@townofnaples.org
	3) Edes Falls Road and River Road junction 30" culvert upgrade and ditching	Culvert that overflows in heavy rain	43°59'53.4" -70°34'21.7"	\$6.5K	Mid term	Road Commissioner	New Project	Ephrem Parashak - Captain - FD - paraschak@townofnaples.org

	4) Wiley Rd @ Sam's Bluff; Upsize existing 30" x 40' corrugated metal pipe with 36" x 40' N-12 culvert and riprap inlet and outlet.	Culvert that overflows in heavy rain	44°00'22.1 - 70°35'27.6"	\$8K	Mid term	Road Commissioner	Deferred - Lack of Funding	Ephrem Parashak - Captain - FD - paraschak@townofnaples.org
New Gloucester	1)Gloucester Hill Rd. Stevens Brook Culvert replacement. Replace with a three sided cement box culvert with a natural bottom. There is also a small dam at this culvert location that, based on engineering design and evaluation, will need to be reinstalled or replaced. 1. Replace three sides box culvert. 2. Widen the road. 3.Replace dam in order to control water levels for fire protection.	Problem is the road is narrow in the area of the brook which is used as a fire pond and the Bridge/ Box culvert is not strong enough for the continued use by fire apparatus. A long with that we have no control or water depth during seasonal water fluctuations.	43.957072/ - 70.286933	Engineering:\$35K culvert/dam \$200K Total cost \$750K	Short Term	Director of Public Works	New Project 2018	Ted Shane-PW director- TShane@newgloucester.com
	1) Ayers Rd; Upsize multiple culverts with (1) 3' x 8' x 40' bottomless box culvert and (1) 3' x 10' x 40' bottomless box culvert, elevate road 300' x 21' x 2' and stabilize shoulders riprap and repave	No problem statement provided	None given	\$116K	Long Term	Director of Public Works	Complete	deputychief@newgloucester.com

	2) Durham Rd; Upsize multiple culverts with 3' x 8' x 40' bottomless box culvert, elevate road 600' x 21' x 2' and stabilize shoulders riprap and repave	No problem statement provided	None given	\$73K	Long Term	Director of Public Works	Complete	deputychief@newgloucester.com
North Yarmouth	1) West Pownal Rd; Continue to monitor erosion at site (elevation of road would cost \$2 million). Site monitoring will continue in order to collect more information and determine the best approach to mitigating the hazard.	Due to the cost of raising the roadway and building a large bridge, the town is evaluating this need on a yearly basis. The flooding causes a road closure for about a day each time it floods. If the flooding increases in the area, we will take a closer look at costs associated with raising the roadway and building a new bridge.	43.52,22 - 70.12.52	UNK	Long Term	Road Commissioner	Revised from 2012 Plan	Greg Payson Firechief@northyarmouth.org
	2) 45-75 Sweetser Road	The Town is currently working with the US Fish and Wildlife Agency to ensure specifications are followed to ensure the proper travel of fish in the stream. This project is expected looked at sometime is 2021.	43.-59". - 70.14'23"	UNK	Short Term	Road Commissioner	New	Greg Payson Firechief@northyarmouth.org
	3) 438 Walnut Hill Road	The town is currently working with the property owner and a contractor on what is causing the water drainage issue. There is a development being proposed on the property behind 438 Walnut Hill Road. We are trying to bring all parties together to bring a solution to the issues.	43-49'-29" -70-14'-53	N/A	Short Term	Road Commissioner	New	Greg Payson Firechief@northyarmouth.org
	4) 494 Walnut Hill Road	Maine DOT has completed some repairs to the roadway this year. North Yarmouth Public Works is monitoring to see if other work needs to be completed.	43-49'-50" -70-15'.04"	N/A	Long Term	Road Commissioner	New	Greg Payson Firechief@northyarmouth.org

	5) 418 Walnut Hill Road	Public Works continues to monitor. They are in hopes that when a development is built onto the property adjacent, it will remedy this problem	43.83 -- 70.25	N/A	Mid term	Road Commissioner	New	Greg Payson Firechief@northyarmouth.org
Portland	1) Implement the One Climate Future Plan which calls for creating resilience overlay zones that require new buildings to be designed and built to withstand climate change impacts. www.oneclimatefuture.org location: Portland & South Portland.	The cities of Portland and South Portland set climate goals to reduce greenhouse gas emissions and to prepare our cities for the effects of climate change. One Climate Future charts a course to meeting these goals.	N/A	UNK	Long Term	Sustainability Director	New	Troy Moon, Sustainability Director, thm@portlandmaine.gov
	2) Reevaluate zoning and development review standards through a sustainability lens. Continue to incorporate and incentivize Green Infrastructure to improve water quality and increase sustainability	The cities of Portland and South Portland set climate goals to reduce greenhouse gas emissions and to prepare our cities for the effects of climate change. One Climate Future charts a course to meeting these goals.	N/A	UNK	Mid term	Director, Planning & Urban Development Department	New	Christine Grimando cdg@portlandmaine.gov
	3) Eastern Promenade Trail Erosion @ EEWWTP - Redirection of hillside runoff to prevent erosion of embankment	Water coming off the hill adjacent to the EEWWTP has created erosion of the embankment to the point of past failure. Project would re-direct water to downhill storm drain and restore embankment.	43°40'20.84-70°14'55.59	<\$10K	Mid term	Director of Public Works	N/A	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov

4) Franklin Street CSO Backflow Prevention and Storm Drainage Improvements	New outfall being installed as part of another project. Project would extend new storm drain to eliminate the flooding in the Somerset Street area.	43°39'51.00-70°15'31.31	\$200K	Mid term	Director of Public Works	2019 Project with SRF funding	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
5) Back Cove Embankment Erosion @ Preble Street - Stabilize bank erosion along walking trail 10'x250'x2' using stone riprap	Embankment of the Back Cove walking trail has eroded/destabilized due to rising tides and storm related wave and wind action. Project would re-establish a stone embankment and stabilize trail.	43°39'55.00-70°16'13.60	\$25K	Long Term	Director of Public Works	New Project 2018	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
6) Back Cove Embankment Erosion @ Preble Street Parking Lot - Stabilize bank erosion along walking trail 10'x1200'x2' using stone riprap	Embankment of the Back Cove walking trail has eroded/destabilized due to rising tides and storm related wave and wind action. Project would re-establish a stone embankment and stabilize trail.	43°39'56.36-70°16'08.34	\$100K	Long Term	Director of Public Works	New Project 2018	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
7) Park Avenue @ Hood Dairy Street Flooding – New Storm Drain discharging to the Fore River or New Stormwater Pump Station within Hood Dairy Parking Lot	This area floods during heavy rain events because it is a low lying area downhill from a heavily developed area with impervious surfaces. Adding better drainage in this location would mitigate flooding during heavy precipitation events.	43.656066,-70.281429	None	Long Term	Director of Public Works	New Project 2018	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
8) Emergency Back Up Power for Public Works Fuel Pumps and Dispatch at Canco Rd.	New fuel pump location serves entire City emergency and public works fuel distribution. Outside Fire/Police dispatch this is the primary City dispatch center to disaster response of Public Works and Forestry personnel.	43°41'11.84,-70°16'54.48	\$20K	Short term	Director of Public Works	New Project 2018	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov

9) Emergency Back Up Power for City Emergency Shelter	The City has emergency backup power at only one building identified as an emergency shelter (Expo) and seeks to have additional emergency shelter locations with backup power to provide shelter during a power outage.	43°41'44.38 -70°18'33.82	\$70K	Mid term	Emergency Management Coordinator	New Project 2018	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
10) Emergency Back Up Power for Bramhall Fire Station	There is no longer an emergency generator at the Bramhall Fire Station, which houses the Portland Fire Department's special response equipment	43°39'12.56 -70°16'19.80	\$100K	Short term	Chief -Fire Department	New Project 2018	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
11) District Road Operation Center	Analysis and replacement of roof structure to prevent destruction of Public Works equipment critical to the maintenance and operation of the wastewater, sanitation, winter maintenance programs.	43°38'52.30- 70°20'24.20	\$500K	Mid term	Director of Public Works	New Project 2019	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
12) Emergency Back Up Power for Ocean Ave Fire Station	There is no emergency generator at the Ocean Avenue station to allow for uninterrupted electricity at this fire station that houses Engine 11.	43.686656, -70.267993	\$20K	Mid term	Chief -Fire Department	New Project 2020	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
13) Army Corp of Engineers Sea Level Rise Projections project	Develop hydrodynamic coastal flood model to identify current and future community/infrastructure vulnerabilities	43.6579179 180784, - 70.2645019 624707	\$138K	18 months	USACE	New Project 2021	USACE

13) Johanson and Front St; Park Side Condos acquisition and demolition of six unit condo complex.	These condos are at an elevation of just under 12. They flood during a large storm event. The work of Morse Street Sewer Separation helped a little but during high tide the storm drain is full and the buildings will continue to flood. One unit (2 condo's) has been vacant since 2015 and was slated for demolition (to my knowledge). Their flooding, to my knowledge, does not impact the city in any way. It has always been on the list as a suggestion based on the known flooding.		\$1-2M	Long Term	City Council	Remove	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
14) Washington Ave. @ Leister Dr; Upsize, realign and lower outlet 36" x 150' corrugated metal pipe with 48" x 150' N-12 culvert and install plunge pool.	No problem statement provided	None given	\$50K	Long Term	Director of Public Works	Resolved	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
15) Gertrude St. Install backflow prevention	No problem statement provided	None given	\$500K	Long Term	Director of Public Works	Resolved	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
16) Capisic St.; Install backflow prevention.	No problem statement provided	None given	\$500K	Long Term	Director of Public Works	Resolved	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
17) Diamond Street CSO Backflow Prevention and Storm Drainage Improvements on Marginal Way	Area floods due to tidal flooding, project aims to reduce street flooding due to backflow.	None given	\$350K	Short term	Director of Public Works	Complete	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov

	18) Culvert replacement at Riverton Drive – Replace two 54” and one 32” culvert by Riverton Housing	The failure of the existing culvert and potential for infrastructure/ roadway damage will result in business and transportation impacts to Portland and surrounding communities.	43°41’55.71” 70°19’24.09”	\$700K	Short term	Director of Public Works	Complete	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
	19) Emergency Back Up Power for Stevens Ave Fire Station	There is no emergency generator at the Stevens Avenue station to allow for uninterrupted electricity at this fire station	43.39.58 -70,17.47	Not given	Mid term	Chief -Fire Department	Complete	Caity Hager, Emergency Management Coordinator chager@portlandmaine.gov
Pownal	1) Partner with Central Maine Power Co. to mitigate trees falling on lines on dead end roads	CMP partners generally rim trees on main roads, not those with only a few houses. This causes longer term outages for many parts of town.	N/A	UNK	Mid term	EMA Director and Road Commissioner	New Project	Jesse Peters/ Pownalcar1@maine.rr.com
	2) Replace the triple culverts at the Verrill Road site with a box culvert to better handle the larger rain events.	with a box culvert to better handle the larger rain events.	43°52’58.38- 70°08’47.94	UNK	Long Term	Road Commissioner	New Project	Jesse Peters/ Pownalcar1@maine.rr.com
	3) Chadsey Rd Site #1 Upstream; Upsize triple N-12 culverts with 12' x 4' x 40' bottomless box culvert and riprap inlet and outlets.	No problem statement provided	43°54’29.29 -70°14’16.62	\$45K	Long Term	Road Commissioner	Deferred - Lack of funding	Jesse Peters/ Pownalcar1@maine.rr.com
	4) Chadsey Rd Site #2; Upsize triple N-12 culverts with 12' x 4' x 40' bottomless box culvert and riprap inlet and outlets	No problem statement provided	43°54’25.13- 70°14’09.12	\$45K	Long Term	Road Commissioner	Deferred - Lack of funding	Jesse Peters/ Pownalcar1@maine.rr.com
	5) Brown Rd; Upsize twin 48" x 40' culverts with 12' x 4' x 40' bottomless box culvert, riprap inlet and outlets and repave.	No problem statement provided	43°54’54.95- 70°08’00.79	\$48K	Long Term	Road Commissioner	Deferred - Lack of funding	Jesse Peters/ Pownalcar1@maine.rr.com

Raymond	1) Monitor/mitigate as needed ditch erosion at Raymond Hill Rd and Webbs Mill Rd Site monitoring will continue in order to collect more information and determine the best approach to mitigating the hazard.	will continue to review this area to monitor any impeded travel and access	43.57.09 -70.29.39	UNK	Long Term	Road Commissioner	New Project	Bruce D Tupper Fire Rescue Chief EMA Director 207-655-1187
Scarborough	1) Gorham Rd at Nonesuch River. Engineering study and replacement of existing 5' culvert	Culvert overtops during heavy rain events. The overtopping closes a major corridor to Gorham/Standish etc.	43.37.09 -70.21.07	\$200-\$300K	Long Term	Director of Public Works	Revised cost	B. Michael Thurlow, Fire Chief/EMA Dir mthurlow@scarboroughmaine.org Mike Shaw, Public Works Dir mshaw@scarboroughmaine.org
	2) Pleasant Hill Upgrade storm drain system.	Undersized drainage system in the "Brown Homes" neighborhood causes basement flooding	43.35'02" - -70.18'16"	\$600K	Long Term	Director of Public Works	Deferred - Lack of funding	B. Michael Thurlow, Fire Chief/EMA Dir mthurlow@scarboroughmaine.org Mike Shaw, Public Works Dir mshaw@scarboroughmaine.org
	3) Broadturn Rd & Martin Ave; Upsize existing twin 36" x 40' corrugated metal pipes with 10' x 4' x 40' bottomless box culvert and add 36" x 40' N-12 culvert on Martin Ave.	Identified as priority in Philips Brook WMP. Undersized culverts causing flow backup in the upstream reaches and stream scour on the downstream reach	43.34'20" -70.23'33"	\$65K	Long Term	Director of Public Works	Deferred - Lack of funding	B. Michael Thurlow, Fire Chief/EMA Dir mthurlow@scarboroughmaine.org Mike Shaw, Public Works Dir mshaw@scarboroughmaine.org
	4) Mitchell Hill Rd; Elevate road 300' x 3' x 22' stabilize shoulders and upsize existing culvert with bridge approx. 100' x 22' with wing walls.	Road overtops at the Nonesuch River eliminating access between Scarborough and Gorham.	43d37'16" -70.25'39"	\$600K	Long Term	Director of Public Works	Deferred - Lack of funding	B. Michael Thurlow, Fire Chief/EMA Dir mthurlow@scarboroughmaine.org Mike Shaw, Public Works Dir mshaw@scarboroughmaine.org

	5) Sawyer St.; Elevate 600' x 22' x 18" add (3) 18" x 40' N-12 cross culverts, stabilize shoulders and repave.	Currently under review with Cape Elizabeth by way of Coastal Community Grant. CE is the recipient of grant.	43.35'18" - 70.15'46"	\$95K	Long Term	Director of Public Works Joint project with Cape Elizabeth	Deferred - Lack of funding	B. Michael Thurlow, Fire Chief/EMA Dir mthurlow@scarboroughmaine.org Mike Shaw, Public Works Dir mshaw@scarboroughmaine.org
	6)Payne Road @ Phillips Brook: Replace (2) 60" culverts with bottomless box culvert	Undersized culverts are causing erosion due to excessive velocity	43.34'27" -70.23'27"	\$350K	Long term	Director of Public Works	New Project 2019	B. Michael Thurlow, Fire Chief/EMA Dir mthurlow@scarboroughmaine.org Mike Shaw, Public Works Dir mshaw@scarboroughmaine.org
	2) Payne Road at Cabela's Boulevard. Engineering study and upsizing of drainage culverts	No problem statement provided.		\$75-\$175K	Long Term	Director of Public Works	Complete	B B. Michael Thurlow, Fire Chief/EMA Dir mthurlow@scarboroughmaine.org Mike Shaw, Public Works Dir mshaw@scarboroughmaine.org
Sebago	1) Route 114 at Long Beach Raise roadbed, install catch basins, improve beach culverts	Long Beach (Rte. 114) area is susceptible to flooding during heavy rains due to poor catch basins (State and Town) share responsibility. the resulting high pressure flows to the beach cause serious erosion and result in diminished water quality. Since Sebago Lake is the water source for much of the County, this is problematic. It is a state road and Maine Dept. of Transportation 's responsibility, but is complicated by private property issues and cost. It has been studied repeatedly over the past 2 decades, but no progress has been made.	43.50.38 / -- 70.37.36	UNK	Long Term	Town Manager	New Project as asking for assistance in engaging MDOT	townmanager@townofsebago.org
	2) Shore Road: 600' surface improvements, add gravel cross culverts	To provide better drainage	43.41 -70.5'	\$100K	Short Term	Road Commissioner	New Project	Jason Schoolcraft sfd_2001@yahoo.com
	3) Anderson Road: ditch, cross culverts and repave	Improve road and provide better drainage	43.53 -70.37	\$90K	Long Term	Road Commissioner	New Project	Jason Schoolcraft sfd_2001@yahoo.com

	4) Peabody Pond Rd. Ditch and line 1,800' add (2) driveway culverts 15" X 30' and (12) cross culvert 15" x 40' remove ledge from ditch line. Second cross culvert 4' x 45"	Improve road and provide better drainage	48.56 -70.41	\$75K	Short Term	Road Commissioner	Revised from 2102 Plan In progress	Jason Schoolcraft sfd_2001@yahoo.com
South Portland	1) Fessenden St @ Trout Brook; Upsize existing twin 36" x 50' culvert with 3' x 8' x 50' bottomless box culvert and riprap inlet and outlet	Road flooding during storms due to inadequate culverts	43.37.51 - 70.14.56	\$65K	Long Term	Director of Public Works	Deferred - Lack of funding	Doug Howard dhoward@southportland.org
	3) Boothby St @ Trout Brook; Upsize existing culvert with 3' x 6' x 50' bottomless box culvert and riprap inlet and outlet.	Road flooding during storms due to inadequate culverts	43.37.53 - 70.14.52	\$55K	Long Term	Director of Public Works	Deferred - Lack of funding	Doug Howard dhoward@southportland.org
	4) city's public access pier (at Thomas Knight Park under the Casco Bay Bridge)	Storms have damaged the attachment points to the breakwater/piers.	43.38.39 - 70.15.27	\$100K	Long Term	Director of Parks, Rec and Waterfront	New Project 2018	Kevin Adams kadams@southportland.org
	5) Willard Beach Stair and Ramp repair	Storms have eroded the beach under the ramp/stairs	43.38.28 - 70.13.31	\$300K	Long Term	Director of Parks, Rec and Waterfront	New Project 2018	Kevin Adams kadams@southportland.org
	2) Alfred St; Upsize existing twin 24" x 40' culvert with 3' x 6' x 50' bottomless box culvert and riprap inlet and outlet.	No problem statement provided	None given	\$55K	Long Term	Director of Public Works	Deferred - Lack of funding	Doug Howard dhoward@southportland.org
	4) Running Hill Rd; Install catch basin.	No problem statement given	None given	\$25K	Long Term	Director of Public Works	Deferred - Lack of funding	Doug Howard dhoward@southportland.org

Standish	1)Smith Mills flooding risk – study alternatives	One way, no alternate exit for about 30 homes.	43.46.47/ - 70.32.54	UNK	Long Term	Director of Public Works	New	Zach Mosher zmosher@standish.org
	2) Emergency shelter identification and surveys	Currently no shelter designated, but need to have an effective plan in place	N/A	UNK	Mid Term	Emergency Management Director	New	Zach Mosher zmosher@standish.org
	3) Blake Rd; Upsize existing twin culverts 36" x 40' culverts with 8' x 4' x 40' bottomless box and riprap inlet and outlet	During heavy rain events water will top roadway and undermine the asphalt	43°44'01" - 70°31'60"	\$70K	Long Term	Director of Public Works	Deferred - Lack of funding	rmosley@standish.org
	4) Middle Jam Rd; Install precast head wall with wing walls on inlet and outlet of 40" culvert.	During heavy rain events the culvert under the canal is not able to handle the volume of water. When the water backs up it has the potential to infiltrate around the ends of the culvert and into the road base.	43°49'26" -70°27'9"	\$15K	Mid term	Director of Public Works	Deferred - Lack of funding	rmosley@standish.org
	5) Northeast Rd @ Rt. 35; Ditch and armor 300' add 30" x 30' N-12 driveway culvert.	During heavy rain events the culvert and ditch cannot handle the volume of water.	43°44'27" - 70°32'45"	\$7K	Mid term	Director of Public Works	Deferred - Lack of funding	rmosley@standish.org
	6) Route 35A – Cape Road; upsize culvert, create spillway, armor downstream side of road bed.	No problem statement provided	43°43'42" -70°34'47"	Unknwn	Mid term	Director of Public Works	Deferred - Lack of funding	rmosley@standish.org
Westbrook	1) Presumpscot River landslide study	Clayey soils along the Presumpscot + Stroudwater River corridors are susceptible to landslides, as demonstrated by 3+ acres of land being swept away on 9/16/2020. Factors affecting the susceptibility + vulnerability to liquefaction should be studied + included in the building + land use ordinances to avoid damages, injury, loss of life	43.687814 / -70.342232	\$800K	Mid Term	City Engineer	New	edudley@westbrook.me.us

	2) Brook Street. Replace bridge over Minnow Brook with new culvert to meet crossing standards	Undersized box culvert that is beyond its useful life	43°43'3" - 70°19'43"	UNK	Long term	Director of Public Works	Retained	edudley@westbrook.me.us
	3) Cottage Place. Culvert upgrade to meet crossing standards.	Undersized multi-plate culvert conveying stream that is in failure.	43°40'57" - 70°21'18"	UNK	Long term	Director of Public Works	Retained	edudley@westbrook.me.us
	4) Purchase and demolish building at 40 Lincoln St.	Residential home in 100 YR Floodplain	43°40'51" - 70°22'15"	\$250K	Long term	Economic Development Director	Retained	dstevenson@westbrook.me.us
Windham	1) Water quality improvement in several area of town	We will also continue to work through our planning department and our sustainability coordinator to improve our watershed areas as we continue to work on improving water quality. Much of these projects have resulted in grants to private road associations and lake associations around town to improve drainage, runoff and storm water compliance.	multiple areas	UNK	Long term	Planning Department and Sustainability Coordinator	New Project	bjlibby@windhammaine.us
	2) Community Public Education	Many residents and newcomers are not aware of water quality issues and mitigation steps	N/A	UNK	Long term	Planning Department, Sustainability Coordinator, and EMA Director	New Project	bjlibby@windhammaine.us
	3) Highland Cliff Rd @ Annie Leighton Brook. Add second culvert	No problem statement provided	None given	\$45K	Long term	Director of Public Works	Complete	bjlibby@windhammaine.us
	4) Nash Rd; Elevate road 1,200' x 21' x 2' stabilize shoulders add 24" x 40' N-12 cross culvert and repave.	No problem statement provided	None given	\$74K	Mid Term	Director of Public Works	Complete	bjlibby@windhammaine.us

Yarmouth	1) Develop building codes and fire sprinkler codes for all new construction	To assist in mitigation of fires, particularly wildfires on Little John Island	N/A	None	Mid-Term	Town administrator, planning board, code enforcement	New	MRobitaille@yarmouth.me.us
	2) Ledge Rd; Install headwall and wing walls on inlet side of Pratt's Brook.	No problem statement provided	None given	\$182K	Completed	Director of Public Works	Completed in 2018	mrobitaille@yarmouth.me.us

Section 6: Maintenance

Requirement §201.6(c)(2)(ii)(C):	Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.
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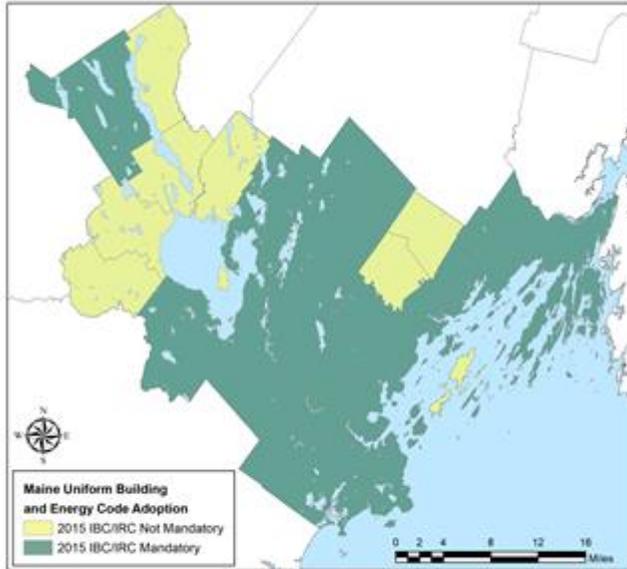
The Local Capability Assessment Analysis spreadsheet, found in Appendix 3 Planning, examines each town’s progress (begin on line 67) in developing policies and ordinances that protect hazardous areas. Among the list of other self-reported plans, Figure 6-1 shows a number of plans enacted by municipalities to mitigate the threat of hazards.



Figure 6-1

Maine has a Mandatory Shoreline Zoning Act [Issue Profile Mandatory Shoreline Zoning Act](#) which further limits growth near the many lakes, ponds and rivers in Maine.

CEEMA depends on the towns to update their plans on a regular basis and offers technical assistance to help in that process. Home rule requires that the towns bear that responsibility.



The Maine Uniform Building and Energy Code (MUBEC) mandates the adoption of the most recent International Building Code (IBC) and International Residential Code (IRC) for all jurisdictions with populations equal to or exceeding 4,000 (Figure 6-2). Jurisdiction population is determined using the 2010 U.S. Census. Where code adoption is not mandatory, jurisdictions may still, and often do, elect to adopt the most recent codes. Please refer to the MUBEC statute, the Office of the Maine State Fire Marshall, and the National Building Code Adoption Tracking Portal for more information.

Figure 6-2: MUBEC adoption requirements for Cumberland County jurisdictions.

(MUBEC statute: <https://www.maine.gov/decd/sites/maine.gov.decd/files/inline-files/642c001.docx>, State Fire Marshall: <https://www.maine.gov/dps/fmo/building-codes>, Portal: stantec.maps.arcgis.com/apps/MapSeries/index.html?appid=a053ac48343c4217ab4184bc8759c350).

§201.6(c)(4)(ii)	The plan shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvements, when appropriate
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It must be recognized that there is a variety of governance structures within Cumberland County. Some municipalities can adopt ordinances and other regulatory mechanisms by council or select board vote, while other municipalities must put such proposals to a town meeting vote. The citizens in attendance at these meetings have a vested interest in the town and how and what is funded annually. Through the municipal budget process and long-term planning based on the identified mitigation actions, towns will be better able to allocate funding for these projects to safeguard their communities. In all cases, the need to educate the public as well as elected officials is paramount

Planning mechanisms at the municipal level include:

- Nineteen towns have Comprehensive land use plans. Comprehensive plans are policy documents that address a wide range of issues affecting the future of the community, and those relating to public safety and environmental protection would be consistent with the strategies contained in this plan. In general, local comprehensive plans do not include recommendations on specific projects, although they may contain recommendations that roads and their associated infrastructure be upgraded as funds become available.

- Participation in the National Flood Insurance Program. All jurisdictions are part of the NFIP. In addition, two communities have attained Level Eight in the Community Rating System.
- Capital improvement plans (most of the larger municipalities have capital improvement plans; some of the smaller ones do not, but they do have local budgeting processes which are used to examine potential expenditures in detail and establish overall spending priorities).
- Road maintenance planning efforts: These may include priorities for local improvements, but not necessarily engineering studies or cost benefit analyses. Because these can be very expensive, many towns do not have the requisite funds to complete these projects on their own.
- Emergency management and mitigation planning.
- Fire prevention planning and coordination, including participation in mutual aid agreements and multi-town wildfire training exercises, and:
- Grant writing (many of the County’s municipalities have been active in applying for grants to address municipal priorities).

In addition to these standard municipal planning efforts, a number of jurisdictions provided additional information on how this Hazard Mitigation Plan is incorporated into local planning mechanisms:

Jurisdiction	Is the County HMP incorporated into local planning mechanisms	Are local plans/development trends used to inform mitigation actions
Freeport	Not that Im aware of not sure what the county plan is - new to job	see #1
Gray	yes we do	comprehensive plan and historical damages
Bridgton	I'm the only one aware of the plan	development plan, comprehensive plan
Harpswell	in updating of ordinances	development plans, past incidents
New Gloucester	Yes we do.	I have not done this yet but I will.

Scarborough	Yes	Yes
Sebago	We do when we revise our ordinances such as the Land Use and in the next edition of our Comprehensive Plan	No we have not as we never really gave it any thought. Since it has been brought to our attention, we will begin to incorporate the process.
Cape Elizabeth	The elements of the mitigation plan are well represented in the comprehensive plan. These include floodplain mapping and support for floodplain regulations, shoreland zoning and climate change adaptation. The Emergency Management Director and their participation in county efforts is included in the plan. The Town Risk Assessment report done by GPCOG was incorporated and identifies municipal facilities at risk due to flooding and storm surge. This report was useful because it had very specific information about Cape Elizabeth.	Yes. Two specific plans that would be referenced while submitting projects would be: 1. The Town's Comprehensive Plan, and 2. The Town's Culvert Assessment Study.
Portland	The City's comprehensive plan, Portland's Plan 2030, recognizes climate change, flooding, sea level rise as critical policy challenges for the coming years in multiple places throughout the plan. As we evaluate potential zoning or other code changes, we are also evaluating these with considerations for climate resilience. The Cumberland County Hazard Mitigation Plan is not specifically referenced in the comprehensive plan, though we do sometimes utilize some of the data sources used in the hazard mitigation plan.	Yes, our municipal plans are referenced when reviewing and submitting projects for the Cumberland County Hazard Mitigation Plan. The City plans that are most closely tied to the County Hazard Mitigation Plan are: One Climate Future and Portland's Plan 2030 (the City's comprehensive plan, adopted 2017).
Brunswick	Not at this time. It has been discussed. Currently the three projects that are noted don't really cross over into the plans directly.	Not at this point, though we are looking at doing this. These are carry over items from the last plan. They are discussed in the CIP.
Casco	Yes	Yes, from the planning board review
Yarmouth	NO. As we embark on our comprehensive plan we will use this as a resource and guide as we move forward	We have not submitted plans to the County
South Portland	Sort of, we submit the projects that we might use funding for but other than that we have no mitigation plan	Not that I am aware of
North Yarmouth	yes	YES - Towns CIP plan

Chebeague Island	We rely on our comprehensive plan to when making zoning change recommendations.	We try and rely on the Comprehensive plan and other town approved plans.
Raymond	Yes as reference.	We would consult them if we have to submit a plan.
Naples	We do refer to the plan as necessary but have not made any significant local regulation changes that were influenced by the County Mitigation Plan.	We do not. We assess our local issues that may potentially require mitigation based on public input, elected official's suggestions and municipal department head evaluations.
Windham	Yes, We use it to guide work.	Yes
Baldwin	Yes, the planning board has access to it as well as code enforcement.	No
Falmouth	Yes	Yes
Harrison	yes	yes
§201.6(c)(4)(i)	The plan maintenance process shall include a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle	

CCEMA continues to monitor the Plan with the help of participating local Emergency Management Agency Directors. Monthly local director meetings are held to update participants on County events, trainings, exercises, and work progress, and hazard mitigation is a frequent topic. Each year in October, CCEMA requests a progress report on the projects listed in the Strategy Section of the current plan. In 2020, the methodology for Monitoring was moved from individual emails to a shared Google spreadsheet. This was done to eliminate the need for CCEMA to send individual messages to local EMA directors and to transcribe the contents of municipal emails to a master sheet. An email with the link to the Google sheet was sent, and several reminder emails, reminders in local director meetings, and phone calls were made to ensure participation.

Plan evaluation occurs through various local and county actions. The CCEMA Planning group will review risk assessments annually and after disaster declarations and plan revisions that better represent hazards profiled in the county. CCEMA will also evaluate the Plan's effectiveness through frequent conversations, briefings, workshops, trainings and other measures with participating jurisdictions.

The Plan is updated every five years and is informed by the monitoring efforts presented above; Information from participating jurisdictions is compiled to update information within the sections of Risk Assessment, Capability Assessment, Mitigation Strategy (mitigation actions) every year; Plan Maintenance (plan integration efforts) and Plan Adoption (every five years). The planning group will shape the Plan update based on review of this information in addition to new information from disaster declaration or significant changes in hazard science, legislation, or FEMA Hazard Mitigation Plan Regulations and/or guidance.

As the strategies are updated and added to as new risks become apparent, CCEMA notes the needs for funding and as grants become available, that information is passed along to the municipalities.

Beginning in 2020, CCEMA asked for public comment through a Public Participation Survey. This practice will continue to allow for fuller public participation in the Plan maintenance.

CCEMA will, beginning in 2021, develop some webinars to educate public officials on the importance of the mitigation efforts in their towns, and will attempt to correlate these presentations with increased mitigation activities in those municipalities.

CCEMA considers the Mitigation Plan to be a living document which must be regularly scrutinized for viability and relevance. Therefore, at least annually, the document is reviewed and compared to FEMA requirements and best practices.